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BY MARK CLIFTON AND ALEX APOSTOLIDES



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Astounding

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• NEXT ISSUE ON SALE FEBRUARY 20th 1954 •



WHAT THIN PARTITIONS



By MARK CLIFTON and ALEX APOSTOLIDES

The Quartermaster's Corps was due for a slight problem. Wonder what they would do with an order requiring procurement of six poltergeists?

Illustrated by Vidmer

*Remembrance and reflection, how allied;
What thin partitions sense from thought
divide* Pope

EVEN after four years, the changing of the shifts at Computer Research, Inc., fascinated me. Perhaps it was because the plant had grown so fast, fed by the steadily increasing government orders. Perhaps it was seeing the long line of windowless buildings across the grassy square suddenly boil at their base as two thousand employees surged in and out at the sound of the shift bell.

Could be, as personnel director, I liked to speculate on which of those intent or laughing faces would suddenly cease to be an abstract problem and become a real one. Or the other way around; could be I liked to get away from the pile of reports on my desk, and just remind myself by looking at all these people that there could be even more problems than there were.

There could be problems I had never faced before. Could be there were things behind those faces streaming past my window of which I'd never dreamed. I found myself staring even more intently at the faces, trying to catch a glimpse of such possibilities. But, then, how could we recognize something of which we've never even dreamed?

"Is your intercom signal out of order,

Mr. Kennedy?" my secretary's voice broke in on my reflections. I turned from the window and looked at her with a start. She was standing in the doorway with that half accusing and half understanding look on her face, so characteristic of her.

"I suppose I just didn't hear it, Sara," I answered. "Or didn't want to hear it," I amended, being honest with her. "What is it this time?"

"A termination," she answered. "P-1, Assembler. Annie Malasek."

I sighed and walked over to my desk. I wasn't in much of a mood to go into my act; it was late in the afternoon and I felt I'd done my day's work already. But it was my job to keep any employee who rated P-1, Production Very Top Class, from leaving us if it were possible. There weren't many who ever got that good, and the few who did were too valuable to entrust to the assistants, interviewers and counselors, in the outer offices.

"O.K., Sara," I agreed. "Send her in."

Sara turned away from my door, and I picked up some papers from my desk and began looking at them. I was above making employees stand and wait while I pretended to be busy; that was a little man's trick. But I wasn't above pretending I was glad to interrupt important work just for them. It was a part of my act which worked sometimes.

It didn't seem to have much effect on Annie, however. She just stood there in my doorway looking hostile.

"All I want is my check," she said with emphasis.

I smiled a little more and indicated the crying chair with my eyes. She didn't obey my unspoken request. So I spoke it. She still hesitated in the doorway, her training to obedience battling with her independence. Independence won, temporarily.

"All I want is my check," she repeated, and then made the expected mistake. "I ain't here to make trouble for nobody."

"Is that the reputation I've got over in the plant, Mrs. Malasek?" I asked softly, putting the right amount of ruefulness in my voice, shrugging my shoulders a little bitterly. "That nobody wants to talk to me because I'll make trouble?"

It caught her off base, of course, as I'd intended. "No sir," she said hastily, "I didn't mean that."

"Then suppose you sit down," I said firmly, "and tell me what the trouble is." This time obedience won, naturally. She sat down on the edge of the chair and leaned forward. She wasn't committing herself completely, not until she'd got her anger off her chest. They never do. They steam themselves up for days or weeks, and you've got to turn the right pet cocks and let the steam escape gradually, or else they'll blow their top.

She started it with a lot of trivialities and I let her run on for a while. They seldom tell you what's really bothering them—it's too close to them, they're afraid you'll think it is silly. That's where most counselors fall down. They take these surface complaints as being the real issues, and waste all their effort striking at shadows.

"What's really bothering you, Annie?" I asked after a time. I gave her

that look which says, "These things you've been talking about are all right to tell other people, but you and I, we know—"

It caught her off base again. As usual, she hadn't intended to tell me the real trouble. And now she had to. She sat back a little into the crying chair, an unconscious admission that I'd won. Two large crystal tears began forming in her black eyes and began to run down her leathery cheeks.

Without making a production out of it, I opened my top drawer and took a clean handkerchief from the stack. I shoved it across the desk at her, without appearing to notice what I was doing. Without appearing to notice what she was doing, she picked it up and dabbed at her cheeks.

"It's about Jennie," she said after a moment's hesitation. She wasn't sobbing. It was just that the tears kept welling up and starting to run down her cheeks before she remembered to wipe them away.

"Jennie?" I prompted.

"My kid," she answered. "She don't get along with the other kids in your nursery."

I winced inwardly as she identified the plant nursery as my personal project. It was. And it was a sore spot, maybe a mistake. I hadn't thought it out very far. It seemed like such a good idea to make provision for care of the small children right there at the plant. But it's one thing to handle employees. It's something else entirely to start handling their children—and do it successfully.

"The teachers neither," she said, and this time her hostility flared up, hotter than ever. Unreason took over again. "I want my check, and then I'm going to march straight down to the Industrial Welfare Commission. They'd be very interested in certain

things about certain teachers and certain foremen—"

"What did the teachers do?" I interrupted in a casual tone, just as if her threat to call in the IWC weren't a real one. Once those lovely theorists who learned sociology from a book written by a sociologist who learned things from a book written by—

"They lie about my little Jennie," Annie answered hotly. But her eyes showed she wasn't too sure they were lying. Too plainly they showed dread, uncertainty, guilt, fear.

I picked up my pencil and began twirling it in my fingers. I wasn't ready for her to realize I had looked into her eyes. She had to go through her defensive pattern first, get it out of her system. I kept my eyes on the pencil.

"What kind of lies?" I asked.

"They say I got to take Jennie outta the nursery," she said, her eyes glaring anger. "They say my Jennie ain't good enough to be with other kids."

I knew the teachers in the nursery well. I'd picked them. Considering the jobs they had, they were pretty nice gals. Reasonably practical, too, considering they had degrees in education that were exceptional.

"What do they really say, Annie?" I asked quietly.

"They say they can't manage Jennie," she answered truculently. "They say she throws things." We were getting down to bedrock now. A fond mother defending a spoiled brat, a little monster sweet only to mother's eyes.

"And does she?" I asked, and was so far off the beam I wasn't even braced for the answer.

"She can't help it if things just fly through the air when she gets mad," Annie said defensively. "They always gripe over there because fires start around her. I just get burned up, Mr. Kennedy, when I think about

it. She can't help it if she starts fires. Anyway, they're only little ones that really don't hurt anyone."

I kept quiet.

"She don't start the fires because she don't have no matches," Annie said with determined logic. "How could she start fires without no matches?"

"Did it ever happen at home?" I asked.

Annie dropped her eyes and began to twist her fingers around one another in her lap.

"Lately," she said almost soundlessly. "That's why I brought her down to the nursery here. She was all alone in the room we rent. I got nobody but her, nobody to look out for her. I got to work hard all the time."

I had a sudden vision of the stark barrenness of this woman's life. Husband gone, or maybe never had one. Neighbors with their nasty little suspicions kept in a roiling turmoil these days by world conditions, delighting in relieving the monotony of their lives by dark looks, remarks they'd know she'd overhear. A small child, locked in a bare room all day, not playing with the other children, a mother coming home at night too tired to more than feed her.

The picture was all too clear, and nagging somewhere at the back of my mind was a series of case histories of children with similar environments.

"Annie," I said suddenly, "let me look into it. Let me talk to the teachers, get their side of the story. And I'd like to talk to Jennie too, if you don't mind."

The tears welled up faster now, flowed in a steady stream. She dabbed at her eyes and blew her nose with a loud honk. A part of my mind registered that Sara would hear the honk and interpret it as the signal to get the next interview ready. This one was over. The problem had been

transferred from the employee to me, as usual. Only this time I wasn't sure yet what the problem was, or whether I could handle it.

"Now suppose you go on over to work, Annie," I said, "and forget about this quitting business. There'll be time to do that later, if I can't help you."

She stood up now and walked toward the door. "I'll get a demerit for being absent from my bench too long," she said, as she put her hand on the door. "I've got a P-1 rating. I don't want no demerits." There didn't seem to be much distinction in her mind between her big problems and her little ones.

"I'll sign a slip to your foreman," I agreed, and pulled a pad toward me. Of course I knew the foremen saved these excuse slips to flourish as an alibi when their production slumped; but I'd fight that battle out, as usual, at the next management conference.

Annie walked out the door, holding the white slip aloft as if it were a prize of some sort. Sara stood silently in the doorway until the outer door had closed.

"You took nine minutes on that beef," she said. "You're slipping."

"The union prefers we call them grievances," I said loftily.

"Well, there's another beef waiting," she said pointedly. "And this time it's a beef, because it's one of the scientists, Dr. Auerbach, not a union member."

"No, Sara," I said with exaggerated patience, just as if she weren't the best secretary I'd ever had. "That isn't a beef either. With scientists it's nothing less than a conflict problem. We don't have beefs here at Computer Research."

"Some day I'm going to have just a good old-fashioned beef," Sara said dreamily, "just for the novelty of seeing what it's like to be a human

being instead of a personnel secretary."

"Well while you're trying to work yourself into it, get me little Jennie Malasek out of the nursery," I said dryly.

"It's not enough," she answered tartly, "that you should twist us intelligent, mature adults around your little finger. Now you got to start picking on the little kids."

"Or vice versa," I answered with a sigh. "I don't know which, yet. Send in Dr. Auerbach, and have Jennie waiting. I want to go home sometime tonight. I, too, am human."

"I doubt it," she said, and without closing the door, signaled the receptionist to let in Dr. Auerbach.

Dr. Karl Auerbach walked in with the usual attitude of the technical man; a sort of zoo keeper walking into a den of snakes attitude, determined but cautious. I waved him to the crying chair and refrained from reassuring him that it would not clamp down upon him and start measuring his reflexes.

He was tall, thin, probably not past forty, a little gray at the temples, professionally handsome enough to mislead a television audience into thinking he was a medical doctor on a patent nostrum commercial. In his chemically stained fingers he held a plastic cylinder, oh maybe four inches long by two in diameter. He carried it with both care and nonchalance, as if it were nitroglycerine he just happened to have with him.

"I understand a personnel director handles employee problems of vocational adjustment," he stated carefully after he had seated himself.

I gave him a grave nod to indicate the correctness of his assumption.

"I assume it is handled on an ethically confidential basis," he pursued his pattern faithfully.

Again I nodded, and this time slowly closed my eyes to indicate assent.

"I am unacquainted with how much an employee tells you may remain off the record, and how much your position as company representative requires you place on the record." He was scouting the essential area to determine precisely where he stood.

"The company is liberal," I stated in the hesitant, pedantic tones so approved by technical men. "Everything is off the record until we have the problem with its ramifications. Then . . . ah . . . by mutual agreement, we determine what must be placed on the record."

Apparently it won his confidence. Well, there was no difference between the learned and the unlearned. Each approaches an unknown with extreme caution. Each takes about the same length of time under skilled handling to get to the point. Each throws up a lot of false dummies and loses confidence if you concern yourself with them. Learned or illiterate, anger is anger; frustration is frustration. A problem is a problem, with the complexity of it purely a relative thing. To each is given problems slightly beyond his capacity to handle them adequately.

"I find myself frustrated," he stated flatly.

I still had a long way to go, for that's nothing new. Who isn't?

Slowly and carefully, disposing of each point as it arose, we threaded our way into the snakepit. The essential facts were that he had been employed as a research chemist, placed under Dr. Boulton, head of the experimental department. This, I knew. Instead of being permitted to do the research chemistry for which he had been employed, he had been kept on routine problems which any high school boy could do.

This I doubted, but recognised it as

the stock complaint of every experimental research man in industry.

Dr. Boulton was approaching the cybernetics problem on a purely mechanical basis which was all wrong. I began to get interested. Dr. Auerbach had discussed with Dr. Boulton the advisability of a chemical approach to cybernetics. I began to get excited. Dr. Boulton had refused to consider it. Apparently he had *not* been excited.

I knew Dr. Boulton pretty well. As heads of our respective departments we sat in on the same management conferences. We were not particularly friendly. He regarded psychology and all applications of it with more than a little distrust. But more important, I had for a long time sensed a peculiar tension in him—that he was determined to keep human thought processes mysterious, determined not to see more than a narrow band of correlation between the human mind and a cybernetic machine. I had already determined that Dr. Boulton would outlive his usefulness to us.

"And how would you approach the problem chemically?" I asked Dr. Auerbach.

We had more discussion in which I proved to him that I was top security cleared, that my chemistry was sadly lacking and he would have to speak as though to a layman, that indeed he was not going over his superior's head in discussing it with me, that there was a possibility I might assist if I became convinced enough to convince general management a separate department should be set up. And finally he began to answer my question.

"Let us take linseed oil as a crude example," he said, and waved my offer of a cigarette aside. "Linseed oil, crudely, displays much of the same phenomena as the human mind. It learns, it remembers, it forgets, it re-

learns, it becomes inhibited, it becomes stimulated."

I don't usually sit with my mouth hanging open, and become conscious of it when I tried to draw on my cigarette without closing my lips.

"Place an open vessel of linseed oil in the light," he instructed, and touched the tips of his two index fingers together, "and in about twenty-four hours it will begin to oxidize. It continues oxidization to a given point at an accelerated rate thereafter, as though finally having learned how, it can carry on the process more easily."

I nodded, with reservations on how much of this could fairly be termed "mental," and how much was a purely chemical process. Then, in fairness, I reversed the coin and made the same reservations as to how much of brain activity could be called a chemical response to stimuli, and how much must be classed as pure thought over and beyond a specialized chemistry. I gave up.

"Put it in the dark," he continued, "and it slows and ceases to oxidize. Bring it back into the light, within a short time, and it immediately begins to oxidize again, as if it had remembered how to do it." He moved to his middle finger. "We have there, then, quite faithful replicas of learning and remembering."

I nodded again to show my willingness to speculate, at least, even if I didn't agree.

"But leave it in the dark for twenty-four hours," he moved to his third finger, "then bring it back into the light and it takes it another twenty-four hours to begin oxidizing again. Now we have an equally faithful replica of forgetting and relearning." He tapped each of his four fingers lightly for emphasis.

"The inhibitions and stimulations?" I prompted.



"Well, perhaps we go a little farther afield for that," he said honestly, "in that we introduce foreign substances. We add other chemicals to it to slow down its oxidization rate, or stop it entirely—inhibitions. We add other substances to speed up the rate, as quick driers in paints. Perhaps it's a little far-fetched, but not essentially different from adrenalin being pumped into the bloodstream to make the brain act at a faster rate. The body has quite a few of these glandular secretions which it uses to change the so-called normal mental processes."

"Where do we go from there?" I asked, without committing myself. But he was not through with his instruction.

"I fail to see any essential difference," he looked me squarely in the



eyes, "between a stored impulse in a brain cell, a stored impulse in a mercury tube, a stored impulse in an electronic relay, or for that matter a hole punched in an old-fashioned tabulator card."

I pursed my lips and indicated I could go along with his analogy. He was beginning to talk my language now. Working with its results constantly, I, too, was not one to be impressed with how unusually marvelous was the brain. But I murmured something about relative complexity. It was not entirely simple either.

"Sure, complexity," he agreed. He was becoming much more human now. "But we approach any complexity by breaking it down into its basic parts, and each part taken alone is not complex. Complexity is no more than

arrangement, not the basic building blocks themselves."

That was how I approached human problems and told him so. We were getting to be two buddies now in a hot thinking session.

"Just so we don't grow too mechanistic about it," I demurred.

"Let's don't get mystical about it, either," he snapped back at me. "Let's get mechanistic about it. What's so wrong with that? Isn't adding two and two in a machine getting pretty mechanistic? Are we so frightened at that performance we will refuse to make one which will multiply three and three?"

"I guess I'm not that frightened," I agreed with a smile. "We're in the computer business."

"We're supposed to be," he amended.

"So you want time and money to work on a chemical which will store impulses," I said with what I thought was my usual brilliant incisiveness. I began to remember that Sara probably had little Jennie Malasek outside by now, and that was an unfinished problem I had to handle tonight.

"No, no," he said impatiently and rocked me back into my chair, "I've already got that. I wouldn't have come in here with nothing more than just an idea. I've been some years analyzing quantitatively and qualitatively the various chemicals of brain cells. I've made some crude syntheses."

He placed the cylinder on the desk. I looked at the long dark object; I looked particularly at the oily shimmering liquid inside the unbreakable plastic case. It caught the light from my window and seemed to look back at me.

"I want," he continued, "to test this synthesis by hooking it up to a cybernetic machine, shooting controlled impulses through it, seeing what it will store on one impulse and give up on another. I simply want to test the results of my work."

"It will take a little doing," I stuck my neck out and prepared to go to bat for him. "The human mind is not as logical or as accurate as a machine. There are certain previous arrangements of impulses stored in certain brains which will cause the mouth to say 'No!' I'll have to do some re-arranging of such basic blocks first." I was grinning broadly now, and he was grinning back at me.

He got up out of his chair and walked toward my door. "I'll leave the cylinder with you," he said. "I read in a salesmanship course that a prospect will buy much easier if you place the article in his hands."

"What were you doing, studying

salesmanship?" I asked, still grinning.

"Apparently it was justified," he said cryptically, and walked out the door.

Sara came to the door and looked in. "You took long enough on that one," she accused.

"It takes a little longer," I said with pedantic gravity, "to lead a scientist to the essential point. He's a little more resourceful in figuring out hazards to keep himself from getting where he wants to go."

But I remembered Auerbach's remarks about salesmanship. "However, in this instance," I mused honestly, "I'm not just sure as to who was leading whom."

"You wanted little Jennie Malasek," Sara said. "You may have her."

I wasn't reassured by the phrasing, the emphasis, or the look on her face.

The time I had lost on the last two interviews, I made up on this one. Children are realists and only poorly skilled in hypocrisy. They will go along with the gag if an adult insists on being whimsical, conciliatory or fantastic, but only because adults are that way and there's nothing they can do about it.

Sara brought Jennie in, gave me a cryptic look, and closed the door behind her as she left.

Jennie stood at the door, a dark little thing, showing some evidence that the nursery teachers had made an attempt to clean her up before sending her over. They hadn't quite succeeded. There was no chocolate around her pinched little mouth, so Sara hadn't succeeded in capturing her either. I wondered why they hadn't combed her black hair, and then realized Jennie might have pulled it down in front of her face for something to hide behind. Her black eyes gleamed as she peered at me through the oily strands.

"Sit in this chair, Jennie," I said casually, and went on being busy with things on the top of my desk. My request wasn't quite a command, but took obedience entirely for granted. It didn't work with Jennie.

She still stood at the door, the toe of one slipped foot on the arch of the other, her thin little legs twisted at an odd angle. Her look was neither defiant nor bashful. Nor was it courage covering fear. I was the nearest source of immediate danger. I should be watched. It was simply that, no more.

I felt I should pity her, that I should warm to her desperate isolation. I was willing to feel sympathy because she did not ask for it, because ordinarily I admired and liked people who did not accentuate their pathos with calculated fraud.

I found, to my surprise, that I did not like her. Oddly, I felt she knew it. And even worse, I felt that, knowing it, she was not hurt. But at least she did call for respect. Whatever she was, she was sincerely—whatever she was. I would not be a fraud either. I went to the point.

"They tell me, Jennie," I said as matter-of-factly as I could, and I'm experienced at it, "that you throw things and set things on fire."

If I expected either a burst of tears or defiance, I was mistaken. I didn't have time to observe reactions at all.

It was as if a sudden hurricane and earthquake had hit the room at the same time. A desk tray full of papers whizzed by my head; my pen stand crashed through the window back of me; I got a shower of paper clips in the chest; my intercom described an arc and crashed broken into a corner. By the time I had wiped the ashes and tobacco from my ashtray out of my eyes and got them to stay open again, Jennie was gone. Sara was

standing in the doorway with a look of consternation on her face.

I was on my way home before I remembered that when Sara and I had cleaned up the mess, I had not remembered picking up Auerbach's little cylinder, his chemical impulse storer. I last saw it laying on the corner of my desk where Auerbach had left it.

Probably Sara had picked it up and put it away. Anyway, the office was within security boundaries. The cylinder would be safe there.

I put it out of my mind, and wondered if the library had a card index classification under the heading of "Poltergeist."

I wasn't much better prepared when I came into my office the following morning. Yes, of course, there was plenty of literature on the subject under such writers as Fort, books on oriental philosophy and the like. Orthodox psychologists had left the subject strictly alone, their attitude apparently being better to ignore the phenomenon than to risk precious and precarious reputation.

Poltergeistism, then, remained something which one read about as an obscure, far away thing. I found no handy hints to help when one had it to deal with at first hand, no how-to-do-it books on the subject.

Worse, I found myself with a hang-over of uncertainty, indecision. My deft incisiveness was gone. I felt a growing doubt that I had always been as smart as I thought I was.

I shook off the mood as I walked through the outer personnel offices toward my own. No matter how unsure, one must be positive and definite for the sake of the people who depend upon him for some certainties.

Sara had not quite come to the same decision. There was a look of puzzlement on her face when I started through her office toward mine. Un-

certainly of whether she should pick up the usual banter as though nothing had happened; or was I really in trouble? I decided to set her mind at rest at least.

"When you picked up last night, after that little wildcat had her tantrum," I greeted her, "did you put away a little plastic cylinder?"

"Why no, Mr. Kennedy," she said and followed me into my office. "I didn't see one."

We looked in the corners of the room, under the desk, behind the chairs. We did not find it. I opened the window where the broken pane had been replaced, and looked out on the ground. It might have followed the pen stand out the window. I did have a vague recollection of something dark flashing by my head just before I got my face full of ashes. There was no cylinder on the ground.

When Sara is puzzled, she has a way of tapping her chin with her finger and looking up at the ceiling.

"Is that what you're looking for?" she asked, and pointed to the corner above my head.

I looked up and saw the cylinder embedded in the broken plaster. Apparently the jagged edges had caught it and kept it from falling. We hadn't noticed it before, because who looks at a ceiling in a familiar room? Apparently the janitors don't look at ceilings, either.

"O.K., Sara, thanks," I dismissed her. "Try to hold the hounds at bay, gal. I've got some thinking to do this morning."

"I shouldn't wonder," she grinned. "Anybody who calls himself a personnel psychologist, and then forces little children to have tantrums in spite of themselves—" The door closed, and saved me the trouble of hearing the completion of her sentence.

Yes, Sara was back on familiar ground. I wished I were.

I dragged a spare straight chair over and stood up on it to get the cylinder. It didn't want to move. Plaster fell around me. The jagged pieces holding it now fell away, and still it didn't move. It gave off the impression of pressing upward against the buttonboard.

I took hold of it and tugged. It came away reluctantly, an identical sensation of lifting a heavy object from the ground, in reverse. It remained heavy, invertedly heavy, as I carried it down and over to my desk.

Habit made me lay it on top of my desk and take my hand away. Habit made me grab for it as it shot upward, just as habit makes me grab for a thing which is falling. This time I put it into a drawer, and held my hand over it to keep it down as I closed the drawer.

I sank back into my chair and hooked my toes under the ledge of the desk. It raised into the air, slowly, buoyantly. I took the pressure of my toes away hurriedly. The desk hovered for a moment, tilted in the air. I put my hand on the top and nervously pressed it back to the floor again. I didn't really expect to hear raps on wood or tin bugles blowing, because I knew it was the cylinder in the drawer which was lifting the desk corner.

There was a very logical explanation of why the desk was trying to float upward. The cylinder was pushing it upward, of course. Yes, very logical. I took one of my nice clean handkerchiefs from another drawer and wiped the sweat off my forehead. There was a logical reason for the sweat, too. I was scared.

"Get me Auerbach," I said to Sara in my new intercom. No doubt it was all over the plant by now that I had smashed my old one in a fit of rage. I settled back into my chair again, and pressed my knees against the desk to keep them from shaking. I

shouldn't have done it. The desk bobbed away from me and settled slowly again. I left it there and waited. I sat well away from it, and tried to speculate on what survival factor shaking knees could represent.

Auerbach was not long in arriving. His expression, when he came through the door, was a mixed one of hope I had already got some results for him and touchiness that he should have been summoned like an ordinary employee.

"Take hold of that corner of the desk and lift," I suggested. He looked puzzled, but complied. The desk buoyed upward, this time so strongly that my papers and pen stand slid off to the floor.

"Not so hard, man," I shouted.

"But I barely touched it," he said, incredulously.

I waved him to the crying chair and ignored the accusation written all over his face that I was playing tricks on him. I reached into the desk drawer and pulled out the cylinder. I handed it to him and he took it—from beneath, naturally, to hold it up. It shot up out of his hand and crashed against the ceiling. Plaster fell around him. He spit a sliver of it out of his open mouth as he gazed up at the cylinder.

"Must you be so careless and drop it up?" I snapped.

He didn't answer, and I just let it lay there where it had fallen against the ceiling.

"It isn't natural about what it learns, is it?" I asked, as if there were nothing at all abnormal about the situation.

He brought his eyes away from it and tried to answer, but there was a glaze over his eyes. I noticed his hands begin to shake, and that gave me confidence. My knees had stopped now, with only a small tremor now and then. Auerbach reached over and

tugged at the desk corner, but the desk now hugged the floor as if it liked it and refused to budge.

"It doesn't care what it learns, does it?" I repeated. This time he did a better job of trying to come to his senses. His face was a study in attempts to rationalize what he had seen with what he thought he knew. Apparently he wasn't having much luck. But at least he didn't deny what he had seen. I took courage from that. He might prove to be more intelligent than learned after all.

"Let us," I began in a dry classroom manner, "assume, for sake of discussion, that your cylinder can store impulses."

He nodded, as if this were a safe enough assumption. It was a hopeful sign that I was getting through to him.

"It wouldn't know, of itself, which was up and which was down," I pursued.

"Gravity is a real world condition," he started answering now. "Not dependent upon knowledge. It works whether we know it or not."

"Well that's a point which has been debated for the last several thousand years to no conclusion," I disagreed. "But let's take an illustration. Let's formulate a hypothesis, a variant world condition where biologists might know only natural air breathing animals."

He nodded again, a little more of the daze gone from his eyes. He was capable of a hypothesis.

"An entirely different structure of theory and expression of natural laws would be built up from that," I reasoned. "One of these would be the basic law that to be classified as alive a thing must breathe natural air." I pushed the point into my desk top with my finger.

He felt he should object as a matter of principle; should, in scientific tradi-

tion, discard the main point in favor of arguing semantics and definitions. That was always safe and didn't require one to think. But I didn't let him escape that easily.

"Now suppose, within that framework, a biologist fished a minnow out of a stream, carried it dry to his laboratory and proceeded to analyze it. You and I know the minnow would die in transit. Now he observes that it does not breathe air, and could not have breathed air down in the water, therefore it does not represent a life form at all. That is his real world condition, isn't it?"

"Yes," he agreed hesitantly. "But there would be so many other evidences that it does represent life. He would have to be extremely stupid not to recognize that his basic rules defining life were wrong."

"Let us concede," I said dryly, "that he is very stupid. But let us be kind. Let us say that it is the entire framework of thought in which he finds himself which is stupid. All his life, he has been educated to this framework. Science and society have weighted him down with immutable laws. To question them would represent nothing less than chaos."

"Yes," he urged me now to go on.

"We come along, you and I, and we operate in a different framework of thought. In our world condition, fish obtain oxygen directly from water. *But we could not prove that to him.*"

"I don't see—"

"Look," I said patiently, "since his base law requires life to breathe air, he would demand, as proof of our contention, that we show it breathing air. We couldn't do it. He will not give up the foundation of his science. We can't prove our claim until he does."

"Stalemate," Auerbach agreed. "But where does that leave us?"

"It leaves us with the conception that there may be any number of frameworks, separated from one another by perhaps the thinnest of partitions, each containing its own set of real world conditions, natural laws, consistent within itself, obeying its own logic, having its own peculiar cause-effect-sequences."

"And one of these substitutes down for up?" he asked skeptically.

"Some of the most noted thinkers the world has ever produced contend that the mind is the only reality," I said slowly. "Now suppose we have a child of an ignorant parent. The child has been neglected, left to vegetate alone in its room, never



associates with other children, never has the opportunity to learn what our framework of thinking calls natural law, real world conditions. Such a child might formulate for itself a real world matrix quite different from ours."

Auerbach was silent, but looked at me fixedly.

"For one example, it might take things very literally," I said. "It might form natural laws out of slang phrases. The child's mother uses the phrases, 'It just burns me up.' Suppose then the child, when it was vexed, just literally 'burned things up.' Ever hear of a poltergeist?"

"Oh come now, Kennedy," he remonstrated, "that fairy-tale stuff."

"There are hundreds of carefully documented case histories," I said, without getting heated about it. "Refusal to look at poltergeist phenomena is on the order of the biologist refusing to consider the minnow alive. Things just catch on fire where these poltergeists are. Things just fly through the air where they are. There must be an explanation. We know that."

"We have some statements to that effect," he corrected.

"We have some statements about what is our own basic natural law, too," I countered. "And that's all we have. Just some statements."

"And such statements apply only within the partitions of the framework?" he asked, neither skeptically nor in agreement. He looked up at the cylinder again. "So your explanation for that is a poltergeist phenomenon?" he mused.

"Yes."

"I wish you had some other explanation," he said. "I don't like that one. Almost any other kind of an explanation would be better."

"So do I," I answered in complete agreement, "but that's the only one I've got. You see, I saw a poltergeist

activate it. Apparently the force of her mind, acting on it, stored it with impulses from her own framework of reality. It would not be particular what it learns, so long as what it learns is consistent with the process used in learning it."

He sighed deeply. "I wish that biologist hadn't picked up that minnow," he said, wistfully.

After my secretary had made suitable protocol negotiations with the general manager's secretary, I headed for Old Stone Face's office, Mr. Henry Grenoble, that is. On the way out of my office, I had trouble with my feet. I was almost floating as I walked along, carrying the cylinder. I detoured over by Receiving and surreptitiously weighed myself on the scales. They read thirty pounds.

"Obviously out of order," I found myself giggling, and wondered if the mood had anything to do with my sensation of weightlessness. Suddenly from the odd looks of employees, it occurred to me that I was buoyantly tripping down the corridor on my toes and giggling to myself. I blushed and tried to look stern. It wasn't easy to stride purposefully when you weren't sure your feet were touching the floor. I hoped they wouldn't think I was drunk, or worse.

"Morning, Henry," I said to the general manager, and received his noncommittal nod. I wasn't his fair-haired boy, but neither was I a thorn in his side. We got along all right by mutual and tacit agreement to leave one another alone. It was the regret of his life that such inefficient machines as people had to be used in his plant, and he was glad enough to leave their management to my care.

I walked over to a straight chair, put the cylinder down under its seat, and watched the chair float upward

toward the ceiling. Old Stone Face watched it, too.

I had the satisfaction of seeing a slight widening of his eyes, a quick breath, and a slight thinning of his lips. Obviously, he thought it cataclysmic. I pulled the chair down by grabbing hold of one of its legs, and retrieved the cylinder.

I stooped down and placed it under one corner of the desk.

"Lift," I said.

He took hold of the desk corner hesitantly, as if he were reaching for a pen to sign a raise authorization. The desk corner tilted upward and slid some papers off on to the floor. I reached under and pulled out the cylinder. I handed it to him, this time taking care that it didn't shoot out of his hands toward the ceiling. He felt how heavy it was, in reverse. Out of habit, he laid it down on the desk top, but I was ready for that. I grabbed it about two feet up in the air. Too many broken up ceilings would really start gossip in the building maintenance crew.

Old Stone Face reached for it again, and headed for his little private bathroom. I followed him to the door, and watched him step on the scales. He came out, and handed me the cylinder.

"And I've been trying to do it by dieting," he commented. He sat down at his desk and picked up the phone.

"Get me the Pentagon," he commanded. "Yes, sure, the one in Washington. I don't suppose anybody's walked away with that in their pocket yet. The last time I was in Washington it was still there." He put the receiver back on the hook. "She wants to know if I mean the one in Washington," he commented without expression.

"Now look, Henry," I said warily, "aren't you jumping the gun a little? You haven't asked any questions. You don't know what this is. You

don't know how it was made. You don't know any of the scientific principles behind it. You don't know if we've got legal rights to it. You don't know how it works or why."

"Details," he said contemptuously. "You've got it, haven't you? A man made it, didn't he? What a man can make once he can make again, can't he? What do I care about the legal details? We got lawyers, haven't we? What do I care about scientific hows and whys? We got experts, haven't we? Why should I ask questions at all? We got antigravity, haven't we? Don't answer. I know the answers."

They weren't precisely the questions I would have asked, but then, each to his own framework. Then it struck me with a twist of my stomach muscles. I hadn't realized. I'd been so busy thinking about poltergeists and frameworks of different natural law. I'd been thinking in terms of cybernetics, ability to store impulses, even wrong ones.

"Could be antigravity," I agreed in an awed tone.

"What else did you think it was?" he asked.

"I'd rather not say," I murmured.

"Who made it?" he asked.

"Auerbach, partly," I answered.

"Who's he?"

"Research chemist. Works under Boulton."

"Why didn't Boulton bring it to me? Don't answer. Boulton wouldn't believe it would work. What do we keep Boulton around here for? Don't answer. I hired him. Well don't just stand there. Tell Auerbach to get busy. Promote him. Tell him to put them into mass production."

"It's not that simple," I said, and wondered how to tell him.

"Don't give me alibis." His face took on an expression which he apparently hoped was conciliatory.

"Ralph, don't you start giving me

any of this stall about further research, testing, difficulties, all that folderol. Just put it into production."

"It's a custom made job," I said, trying to slow him down. "Only an experimental model."

"Custom made today, production line tomorrow," he shook his head in exasperation. "Well, what's holding you up?"

"Money, for one thing," I clutched at the first excuse I could think of, and wished it were as simple as that.

He grabbed the phone again.

"Get me the controller," he barked, and waited. "Tim! What took you so long? Give Kennedy all the money he wants!" He listened for a moment and then turned to me. "He wants to know if you'll need more than a hundred dollars. He's got systems, or something." He turned back to the phone without waiting for my reply. "Well," he conceded, "I didn't actually mean *all* the money he wants. Let me know if he draws over a million dollars."

He took the receiver away from his ear and looked at it in puzzlement.

"Must have fainted," he commented dryly, and hung up.

"But," I tried to object, thinking how the organization would be split wide open if I went out into the plant and started carrying out his instructions—all the noses out of joint, the toes stepped on. "I'm just the personnel director. I'm not a plant superintendent. I can't go around building buildings, setting up production lines—even if I knew how."

"Get going," he said. "I don't want any more alibis. All I want is a steady stream of antigravity units. That's not too much to ask for, I'm sure!"

"Maybe a million dollars won't do it," I said hopefully, and truthfully, as I reached for the door.

"Well, all right," he almost shouted. "We'll get a billion, then. We'll get

a hundred billion. What do you think we got taxpayers for?"

"You've been spending too much time in Washington," I commented, as I went through the door. "You're beginning to talk like them."

Maybe Old Stone Face hadn't heard about things which money can't buy—such as a little girl who looks at you from behind strings of black hair. Maybe he hadn't heard about frameworks where money wasn't a consideration. Maybe he hadn't heard about a matrix where the question, "If you're so smart, why ain't you rich?" was on the order of the question, "If it's alive, why don't it breathe air?" Maybe he hadn't heard about frameworks, period.

I hoped I wouldn't have to be the one to tell him about them.

Annie Malasek was waiting for me in the outer personnel waiting room. She had little Jennie by the hand. Annie looked stern, Jennie looked penitent. Annie stopped me as I started past her.

"I just came over to tell you, Mr. Kennedy," she began, "I found out what Jennie did to your nice office last night. I whipped her good. Tell Mr. Kennedy you're sorry, Jennie." She looked down at Jennie sternly, and squeezed her hand.

"I'm sorry," Jennie mumbled.

"Tell Mr. Kennedy you won't do it again," Annie went on remorselessly.

"I won't do it again," Jennie repeated dutifully.

"Tell Mr. Kennedy you're going to be a good little girl from now on, and not burn things up or throw things," Annie pursued with a determined gleam in her eye.

"Good girl," Jennie murmured, and rubbed the arch of one foot with the toe of the other.

I looked at them both, and for once I didn't have anything to say.

There were more conferences with Auerbach. Yes, he could produce more cylinders. Some of the synthetic protein strings were a bit tricky, but otherwise it wouldn't be difficult to duplicate the cylinder. No, just an ordinary laboratory would do, at least until we went into mass production. That's nice, he'd always wanted to be a department head. The latter was said absently, and I doubted he had even heard me.

"How are you going to activate the cylinders?" he asked curiously. I noticed the particular use of the second person pronoun, because in everything else it was "we." Activating them was not his responsibility.

There were conferences with Boulton, whose nose was out of joint that Auerbach had been taken out from under his jurisdiction without consulting him about it. For the sake of organization I had to mollify him. There were conferences with the plant superintendent, who could throw all sorts of petty hazards in my way if he were pulling against me. There were conferences with the controller, the carpenter boss. In short, there were people, and therefore there were personal tensions to be unsnarled.

There was another conference in Old Stone Face's office, this time with a pink cheeked colonel, sent out as an advance scout from the Pentagon. From the look of him it was the most dangerous scouting mission he had ever tried. His pink cheeks grew red as he watched me go through my act with the antigrav cylinder. His pink cheeks grew purple when I evaded his questions with something approaching idiocy. He was certainly not one I wished to introduce to frameworks and partitions. He was a rocket man, himself.

Auerbach was at that conference, and where I had been idiotic, the good doctor was a glib doubletalker. He

sounded so impressive that it didn't occur to anybody he wasn't making sense.

Since the colonel didn't believe what he saw, and didn't understand what he heard, the brass staff, deployed well back of the front lines, would have got a very poor report from their advance scout had we not been Computer Research; and had not Old Stone Face been a frequent visitor to the Pentagon. In this case the colonel was afraid to embroider what he saw with too much of his own opinion. We were duly notified of an impending visitation from a full dress parade of brass and braid. Stirred to unusual action, no doubt, by the plaintive and public outcry of a country boy congressman, "But what do all of them *do*, over there in that big building?"

During this time my staff, like good boys and girls, took over the burden of my work without complaint. I spent a great deal of my time in Auerbach's new laboratory.

We tried all sorts of attempts to make the antigrav aspect of the first cylinders rub off on others he had made. We let them lay coyly side by side for hours and days. We lashed the first to another and let it zoom up to the now padded ceiling. We tried shocking them, freezing them, heating them. Nothing worked. Either the new cylinders had already learned that down was down—that old tired framework—or more likely hadn't learned anything at all.

We thought at them. We stood there, Auerbach and I, working singly, working in tandem, thinking at them. Apparently our thoughts didn't amount to much; or we had learned too early in life that you can't get any effect on a physical object by just thinking about it. They just lay there, fat, oily, and inert.

Auerbach went back to his test tubes and beakers, trying to see if

antigrav wasn't inherent, somehow, in the chemical arrangements. He had accepted the hypothesis of other frameworks as an intellectual exercise, but he still hoped to prove they were not a reality, that the aspect could be accounted for within the framework he knew. He had not accepted the partitions, that his real world condition was circumscribed, confined, limited.

I went back to Jennie.

Obviously, to me, it was the mental force of her fear, hatred, anger, survival potential, whatever it was, acting through whatever framework she had devised for herself, which activated the first cylinder. So I gave up being stubborn, and called for little Jennie Malasek once more.

She came in the door of my office and stood as she had before. This time her hair was pulled back tightly and tied with a ribbon. So she hid behind a glaze over her eyes, instead.

I had about a dozen of the cylinders on the top of my desk, and had a lot of mixed hope and hopelessness within me. I wondered if the admonishments of her mother had had any basic effect upon her. I wondered if the additional attention she was now getting over in the nursery, since the teachers had learned I had taken notice of her, had changed anything in her.

"I didn't tell your mother on you, when you messed up my office that time," I said as an opening sentence.

She didn't answer, just looked at me impassively. But it did seem that she blushed a little. Had she grown ashamed of throwing things and burning things up?

"Just a secret between you and me," I said. "I don't think it is wrong to throw things the way you did. I think it was very clever."

She didn't answer.

"I wish you would do it again. I'd like to see you do it."

"I can't," she whispered in a very small voice. "I'm a good girl now."

Oh no. Character doesn't change that fast. Maybe she thought she was a good girl, but down underneath—

"I don't think you're a good girl," I said with a sneer. "I think you're a very naughty girl, a nasty little girl."

I hoped, how I hoped she would flare up in anger, or protection, and hurl the cylinders at me. I hoped to get a face full of ashes, an office full of broken windows and flying cylinders.

Her face still did not change its expression. She still stood there, impassive. Her only reaction was two large, crystal tears which formed in the corners of her eyes and began to roll slowly down her cheeks.

I flipped my intercom and called Sara.

"Take her back to the nursery, Sara," I said wearily.

Sara came in, saw the tears, and without speaking to me, she took Jennie's hand and led her away.

I sat at my desk and hated myself with contempt and loathing. There were times when I didn't like my job; when I didn't like myself for being skilled enough to do it. There were times when people became a little more than just some material to be shaped and directed into the best use for it.

But my mood did not last. I had a job to do. This was no time to grow soft, sentimental, wavering.

The fact that Jennie was outwardly changing from the strange little creature which excited no sympathy to at bewildered and hurt little girl who very definitely called for compassion changed the facts not at all.

The prime necessity was to activate more of the cylinders. Jennie was the

only means at hand by which that could be done. I wasn't sure that even she could do it, but I had to find out. I had to see if down beneath the surface she wasn't still the same wild instrument of an even wilder talent.

Basic character doesn't change that fast, not just because somebody says it ought to change, not unless there is a violent and traumatic shock jolting the individual completely out of his framework and into another.

I had to go ahead and try.

I spent more, quite a bit more, of the funds at my disposal. The controller O.K.'d my vouchers as if the dollars were individual drops of his blood, and read the legends on the vouchers with a firm conviction that I had really lost my mind.

Old Stone Face asked no questions. He was not one to assign a job to a man and then nag him about the details. He wanted results. But there was puzzlement in his face when he saw no building wings being converted, no assembly lines and moving belts being constructed, no supervisors, cost accountants, production control people assigned to the new work.

Instead, I spent money on animated cartoons, three-dimensional cartoons. A director, experimenting in that new medium, had told me the most difficult job was to keep the action behind the screen, give it depth without illusion that it was projecting out into the audience—to give a stage depth effect without getting a poke in the eye effect.

I wanted the opposite. I wanted my audience, an audience of one, to get the illusion of a poke in the eye. I caused a special nursery to be built, just for Jennie. I had a studio make a short but elaborate sequence which only one person would view.

I placed Auerbach's total supply of new cylinders in various spots around the room, a dozen or so of them. I had

the projectors installed in an adjoining room, and a tiny window, lost in some decoration effects, where I could watch through.

I went to the nursery and got Jennie. She was neither glad nor protesting. The nursery teacher objected a little. Jennie was doing such a fine job of adjusting to the other children now. They had had no more trouble. Apparently all that had been wrong was that Jennie had been starved for attention and affection. But now she was becoming a perfectly normal little girl. Didn't I think so too, Mr. Kennedy? And, are you ill, Mr. Kennedy? You don't look well at all! How kind you are, ill and everything, to think of little Jennie!

I led Jennie out of the nursery over to the new room built especially for her. I did not react. I did not react! I did not react! I could not react, I was one solid mass of self-contempt and loathing.

I put Jennie in the room, wordlessly, and she stood near the door, where I left her. I walked into the adjoining projection room, closed the door behind me, and started punching buttons. It was a form of punishment to make myself walk over to my little window and watch when the automatic machinery took over.

Darkness blotted out the room, then an eerie blue light began to glow over the complex meshes of the screen in front and to the sides of Jennie. Trees, vines, bushes took on form, swayed a little, seemed alive. Knots on the trunks of the trees suggested faces, not kind faces. Limbs and twigs stirred and seemed to reach toward Jennie.

I saw her take a small step backward until she had her back to the door. She turned and pulled at the knob, but the door wouldn't open. She turned back then and faced the



growing light, the clearer scene all around her. I saw her lips move stiffly, and though I could not hear her, they seemed to form the words, "Good girl now."

Far in the distance in front of her a deep red glow appeared, took form, part animal, part reptile and even more horrible, part man. Slowly it seemed to become aware of her; its very deliberateness, its sureness was its greatest horror.

The room was a pandemonium then. The cylinders flew through the air toward the trees, toward the monster, crashing through the screen, tearing

it to shreds, crashing against the padded walls.

On the floor, in a crumpled heap, lay Jennie. She was still and lifeless. I punched a control button to bring the room back to normalcy, and ran into the room to her. Her heart was beating faintly, her pulse a thin string of fluttering.

I shouted into the hall, "Get a doctor!"

I ran back and began to administer first aid for acute shock. It was not until the doctor came from our hospital room and carried Jennie away that I looked around me.

Most of the cylinders lay on the floor, inert, but five of them pushed against the ceiling at the back of the room. The experiment had been a success!

I went to see Jennie in the hospital room. She had come out of her faint and was sobbing brokenly now. As soon as I came into the room, she reached out her hands, grabbed mine.

"I got scared," she said. "You went away and left me. The lights went out. But I didn't do anything, really I didn't. I just got scared."

The suspicion and anger smoothed out of the faces of the nurse and doctor. Her unaccountable reaction of being glad to see me after what I had done to her, her words seeming to carry a completely normal conviction of what might happen to any imaginative little girl who was afraid of the dark, closed off their possibility of searching into what really happened.

But I knew that I would never use Jennie again, no matter what the urgency for antigravity. Some other way would have to be found. I would not do it again. And I doubted now, after this shock—the surface shock of normal fear, the deeper shock of conflict in using the wild talents which made her a bad girl against the affection she was getting for being a good girl—whether she could ever use her framework again, even if I would.

It had been a severe thing, a terrible thing I had done; but no worse than the methods used constantly in mental hospitals to transfer the minds of patients from one framework to another.

I went back to my office, took the cylinder out of my desk, and sat, holding it in my hands, for a long time.

Through the days that passed I became more distraught, overwhelmed by the insolubility of my problem. My staff still handled the bulk of my

work, for it was obvious to them that my interest was far from the petty conflicts and situations of normal plant operation. Department heads became cool toward me, for Sara managed to turn them away before they got in to me.

I wandered the corridors searching faces for some hint of a wild talent beneath the too tame eyes. I thought of advertising for poltergeists in the help wanted columns, and then realized what would happen if some alert reporter happened to pick up the item. I thought of contacting various universities and shuddered at the reception I would get. I even found myself visiting the nursery again, hoping for the improbable coincidence of another poltergeist. But all the little children were being good little fairies and elves and brownies.

The announcement that a full complement of high-ranking military men were going to visit us and assist us in our lagging production of the antigrav cylinders did not reassure me. I had dealt with the military mind, singly and in coveys, before.

I hadn't told Old Stone Face the problem, either. His total framework seemed to consist of "Get out production. Give me no alibis." This was hardly conducive to philosophical meandering.

The day came when staff cars carried general, admirals, colonels and captains from the airport to our plant. Word filtered over the intercom system that they had been closeted in the big conference room with Stone Face for an hour—apparently playing with the five cylinders.

I hoped they wouldn't scratch the varnish of the big conference table against the ceiling of the room. I hoped they wouldn't try to ride around in buoyant chairs. Learning to balance, doing that, was tricky and if they

tilted, a big blob of blubber would find the floor hard and unyielding.

Finally they sent for me.

I left my cylinder locked in my desk and walked up to the conference room under normal gravity, hoping the weight would pull me down to a worried, heavy, lugubrious frame of mind so stylish in the real-world framework.

The conference room was an aroma of dignity, an overpowering impressiveness of brass and braid. Thin faces, fat faces, long faces, squeezed up faces, but Pinky was not there. Apparently he was off on some other dangerous mission. The faces did not, could not, live up to the scrambled eggs and fruit salad of their caps and collars and sleeves and chest.

I thought of Emerson's dissertations on compensation and giggled. What they lacked in those faces they tried to make up for in decorations. I knew that I would not discuss frameworks in this room.

They pressed me for explanations. They bored in deeper and deeper. I could not help it. My mood began to lighten, become irresponsible. I hung on to what dignity I could muster for the sake of the apprehension and alarm in Old Stone Face's eyes. He wasn't such a bad guy. At least he didn't depend on uniforms to make him impressive.

"The first cylinder was an accident," I said to the blur of faces down the long table. "Sometimes accidents are hard to duplicate. So many factors, gentlemen."

"But you did duplicate it," the commanding general pointed out. "You activated five more. We have questioned Dr. Auerbach at length. He knows absolutely nothing of the method you use in activating these cylinders. Apparently no one knows but you. It is imperative that we know."

I was in for it now. I had to explain somehow, or something.

"But, gentlemen," I protested hesitantly, and then heard myself saying, "I spoiled my poltergeist in making this half dozen, and I don't have another."

There was a sigh of relief around the table, relaxation, suppressed contempt. I had not realized before how tense they all were.

"I'm certain," the commanding general said placatingly as if he were trying to reason with a small child, "that it can be replaced."

"They're hard to get," I faltered.

"We will get them," he stated pompously, confidently. "Difficult perhaps for you personally, yes, or even Computer Research." He smiled patiently, "But for the military it is another matter entirely." He turned and waved

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down the table toward another member of the brass trust.

"General Sanfordwaithe is Supply and Matériel. I am sure it is within the power of the combined armed forces to get you all the whatever-it-is you may need."

I looked down the table at General Sanfordwaithe with a question in my eyes. He looked smugly back at me.

"Do you know what a poltergeist is?" I asked.

He looked slightly piqued.

"I am administrative," he reproved gently and patiently, as only a military man can put a civilian in his place. "I do not pretend to be personally familiar with the specifications of every one of the several million items under my jurisdiction." He smiled and his voice became almost waggish. "But I am certain you will find our poltergeist division sympathetic to your needs."

That did it.

"Oh goodie," I exclaimed. "Then maybe you'd better send me a half dozen to start with."

"And is that all that's been holding you up?" the commanding general asked, softly reproving.

"And this time, make them little boy poltergeists," I urged. "Mine was a little girl poltergeist, and maybe that was what was wrong—just too delicate for the job."

I could see by their faces they assumed I was talking about some gadget similar to a male and female electrical plug, and was being cute in my terminology.

"Mr. Kennedy hasn't been feeling well lately," Old Stone Face put in hurriedly. "He's been working very hard. Much too hard. I would have sent him on a long rest weeks ago had this not been so urgent."

They looked at me with some pity beneath their contempt—a soft civilian.

From there on it was no more than

a diplomatic and tactical withdrawal of forces. I withdrew early, to allow Old Stone Face further time for excuses of my behavior.

But they would be back.

The order would go out from General Sanfordwaithe's office to supply me with a half dozen male type poltergeists immediately. It would flow down through the echelons of command, getting sterner and terser. There would be some scrambling around trying to find the poltergeist division, but no one would become alarmed that it had been lost. That was customary.

There would be days, perhaps weeks when the orders would be pigeonholed, on the theory that if you just forget to do anything about it, the need will pass. But General Sanfordwaithe would not let them forget this time. There would be memorandums, each one dredging a little farther down the chain of command before it, in turn, became pigeonholed.

And finally, somewhere down the line, some clerk would know what a poltergeist was. He would first go to the source books and look it up, so that he could have the paragraphs to substantiate him when he tried to tell his commanding officer what was wanted. From there the explanations would flow back up through the echelons of command. Faces would get redder and redder, angrier and angrier.

Yes, they would be back. But until then, I could go back to being a personnel director. I thought, this time with genuine pleasure, of the simple little problems waiting for me back at my office. Nothing more than imminent strikes, lockouts, legal tangles, visits from the Industrial Welfare Commission, and Miss Jones won't let Miss Smith have a fresh pencil until she brings the stub of her old one to supply room.

I walked on down the corridors of the plant and nodded pleasantly to

department heads and key personnel who caught my eye. I saw their faces break with relief, and then grow tart with, "Well, it's about time you came off your high horse and noticed us."

I would have a lot of ruffled feathers to smooth down in the next few days.

Much to their surprise, I spoke pleasantly to the members of my staff when I came into the outer rooms of the personnel department, and ruefully saw them start to dig down into stacks of papers for problems they had been hoarding until I got in a good mood again.

I walked on into Sara's office and quipped something at her. She almost fell out of her chair in astonishment, and began to snifle. Her feelings had been badly bruised.

"There are handkerchiefs in my

desk," I said drily. Her sniffles stopped instantly.

"Now," I said. "Take a letter. General Sanfordwaithe, Pentagon. Confirming our conference of this date, production on the implement in question will not proceed until your Division of Supply and Matériel furnishes us with one half dozen, six, male-type poltergeists."

"Are you feeling all right?" Sara interrupted me with wide eyes.

"I feel wonderful," I answered. "I have learned something from our employees. I have shifted the responsibility for my problem onto other shoulders. I feel swell!"

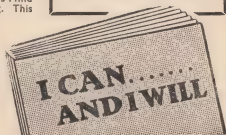
"But what if they should supply them to you after all?" she asked.

THE END

INFERIORITY COMPLEX

An inferiority complex is a disturbance in the Sub-conscious Mind which manifests itself in **Self-consciousness, lack of confidence, nervousness, depression, worry, weak will and habits, lack of enterprise, stammering, blushing, forgetfulness, sleeplessness, etc.** These are symptoms of 'something wrong' within your personality which you can put right—a 'disturbance centre' in Subconsciousness which sends out powerful negative impulses overcoming and paralysing your positive impulses, denying you the pleasures of achievement and the joy of living. You cannot control these impulses but you can remove them altogether by eradicating from your Sub-conscious Mind the trouble from which they spring. This you can do yourself, in your own home in your own time. Send postcard today for free copy of little book which fully expounds the wonderful discoveries of modern psychology and how you can apply them to yourself to achieve a fuller, richer, happier, and more successful life. All correspondence is confidential.

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LITTLE JOE

By ALGIS BUDRYS

Probably the man least apt to understand the nature of a symbol would be the man who was, himself the symbol.

Illustrated by Miller

HOWE drove his car down the empty road that paralleled the fencing of Port Sathrea. The last trailings of the rapidly lifting pre-dawn fog whipped past his fender skirts, and the beams of his headlights were just beginning to turn pale and ineffectual as he pulled over to the shoulder and stopped a few yards from the gate.

The armed guard at the gate stepped forward and stopped him.

"I'm sorry, sir, but no one's allowed on the field until the ceremony this after—" The man's voice, which had been brisk and precise, broke off and became apologetic. "Excuse me, Captain Howe. I didn't recognize you. It's rather dark," he added in explanation.

Howe looked around him, at the cyclone fencing that fell away from him to either side, at the stacked silhouette of the faraway city, and the blue tarmac which, given a sheen by the early dew, stretched away toward the lightening horizon with a faint touch of shimmer. He raised his head and surveyed the violet-blue sky and its stars, weeded out to the primary magnitudes by the approaching dawn.

"Yes, it is still a little dim," Howe agreed. He returned his gaze to the sentry's face, which waited for his notice beneath its overlap of steel helmet. "Is it all right? The pass was issued in something of a hurry."

"The pass is certainly in force, Captain Howe," the guard assured him. He seemed to cast about for a chance to interject a few more words, and to be genuinely glad when he found it. "Anyway, sir, I'd recognize you."

Howe turned his eyes back on the man.

"I"—there was an initial hesitation, and then a rush of words—"that is, my brother . . . Edward Anderson, Stoker 2nd.; perhaps you recognize the name, sir . . . he served with you on the *Maybank*, Captain, and he told me a lot about you."

Howe turned his reflections inward. Anderson? Not the most original name in the world, certainly.

"Yes . . . I remember your brother quite well. He was a credit to the Merchant Service," he lied, finally, and waited for the guard to open the gate.

The gate slid closed behind him, and abruptly his horizon was occupied only by the damp tarmac and the sky, which had now reached cerise in color. It was not until he had made a completely arbitrary turn on the unmarked field and begun to walk diagonally across the area that the hull became visible; a squat, needle-nosed, stub-finned silhouette of flat darkness that rested near the service hangars.

When he tried to count the number

of times and the various places at which he had encountered that familiar stubbornness, he discovered that they had run irrevocably together. He could have arrived at approximate figures derived from average expectancies during the five-year-term of his captaincy on that particular vessel, but could never have assigned a definite port of call to each separate number. He was quite sure, for instance, that he had assumed command at Flushing in '06, and that his next planetfall had been Wolf. He could tick off most of the places to which his career had taken him with fair ease, but he found that he could not even discriminate between the memories of planetfalls in one of his various commands and those in another, much less determine some order, or even, by and large, a coherent purpose.

Still, one would think that there should be something in particular to remember, he thought. Immediately he saw the flaw in his reasoning, for it was not in any one specific voyage, in some peculiarity of cargo or destination, nor even in some hitherto unattainable but now shattered record of performance or payload that the foundation of *Little Joe's* reputation rested.

There's length of service, of course, he thought. *That's part of it.*

But this thought was unsatisfactory for any purposes other than those of partial explanation, for mere tenure was one thing, and *Little Joe's* history was quite another.

He walked slowly but easily toward the ship, the shock of his footsteps on a hard surface perhaps less finely cushioned and compensated than it had been during the years of his physical peak, but, nevertheless, still not indicative of more than forty years of age.

In due course, he stood beside one

of *Little Joe's* landing jacks, and turned his glance upward along the bellying curve of the ship's flank.

She's nae a beauty, but she's a braw bonny lass for a' that, he thought, and found himself confronted with simultaneous problems in introspection. One was easily solved by the inward examination of his memories until he encountered the image of a book about seafaring, and a man's description of *his* command, and the other fell before the rationalization that even *Little Joe's* skipper could be forgiven for an infrequent assignment of a feminine pronoun to the ship.

He abandoned dialectic, having found himself once more fallen into a habit he had acquired soon after his assumption of *Little Joe's* command; that of resting his hand on some projection on the ship's surface, and absently running his hand over the pits that had accumulated in the surface.

The ship had never had the quality of sleekness—even on the ways, the graceful and aerodynamically clean but unmistakably heavy-bodied lines must have made any such impression difficult; the addition of the thick, wide-planed fins with their cylindrical jack housings made it impossible, and the roughly cast heavy-duty plates with which the brawny struts and stanchions were sheathed had obviated even tactile sensuality.

Little Joe was a cargo ship, broad of diameter in the loading locks, massive of bulkhead, and cramped of fo'c's'le, which in spacecraft had returned to its traditional place in the otherwise useless compartments of the tapering prow. The plating bore the marks of rough handling by more than one carelessly jockeyed cargo boom, and running years of contact with the pebbly debris of space had added further markings.



Howe's searching fingers found such a spot, and lingered over it.

The greatest part of *Little Joe's* reputation, I think, he decided, rests in the ship's value as a symbol.

Other craft had, perhaps, gone farther, with greater cargoes. Some were momentarily more famous, for one reason or another. Nevertheless, there was no ship so well known as *Little Joe*, no matter in what part of the galaxy one might be.

One of the first interstellar freighters, a voice, remembered perhaps from one of the recent public eulogies, said in his mind. *One of the first!*

This was true. Not, in all proba-

bility, the very first—but certainly the last survivor of the first. The ship's bedplates and tubes had known more modifications than he would have believed improved engine designs possible. The celestial globe in the navigator's cubby had been replaced time after time, to match the progress of that evanescent line where frontier stopped and unknown dark began. The corners and odd angles of the holds were full of the trapped remains of scores of outmoded cargoes, no longer worthy of shipment from one solar system to another.

He heard, again, *Scout among the farthest frontiers of the human race.*

This was not as strictly true as the first, in its implication that the ship constantly ranged the Imperial rim. *Little Joe* went to whatever port the ship's owners specified, this port invariably being the one at which *Little Joe* served the owners' interests best. True, there had been the run a score of years ago—was Murchison the captain then?—when, as the ship hung coasting at the peak of a great arc, the audiovisual communication from somewhere out of Andromeda's heart had come sputtering into *Little Joe's* searching receivers, but, though the message, recorded and re-recorded, was permanently safe in the history of the First Galaxy, no other message had ever been caught, nor had the ship been sent to search for any such.

Pride of the Merchant Service, the remembered voice repeated in Howe's mind. This last was never true—not in any utilitarian sense. The ship was neither the largest, the fastest, the finest, nor the most efficient of all the cargo craft that knitted together the fabric of human civilization. *Little Joe* was merely the best known.

And so, he thought, *we return to length of service*, but he had already decided that this was, at best, only a partial answer, unless one analyzed and classified all the multitudinous data of the ship's history and functioning, in order to determine the manner of its service. And here, perhaps, was the proof of his earlier decision that *Little Joe* was somehow a symbol of the human race and its progress into the stars.

He took his eyes from the broken gleam of the ship's hull and saw that dawn had fully broken, and that the sky had lightened into cirrus-combed blue. He stood quietly for a moment, living in the morning air on the tarmac, and then began to climb into the

ship's fin on the ladder exposed by the extended jack.

Little Joe's interior was purposely cramped. The ship had not been designed for promenades, and the cargo holds were intersticed with a minimum number of rigidly measured companionways. Captain Howe bent himself into the one-man elevator that served when the ship was vertical, and rode immediately up to the bridge.

He knew the bridge better than any other area on the ship—the difference in his familiarity with the various other departments and divisions being only a shade less than imperceptible. The bridge, however, was his particular piece of property aboard *Little Joe*; the platform from which he directed the ship's operations, the nerve center at whose heart he interpreted the hurrying messages of *Little Joe's* electric ganglia, and from which, in turn, his orders were returned along those same pathways. From the bridge, he directed the sometimes delicate task of berthing, and the always precarious functions of blast off.

He looked down, and saw another fragment of the legend of *Little Joe*. Nestled in clear plastic, a pair of dice had been set into the main instrument board by some one of his predecessors who had already been conscious of the growth of the ship's peculiar aura. Each die, of course, was turned so that the face bearing two dots was turned up toward the viewer. There was even a sub-legend about the one time when the faces on the dice changed, so that they totaled two, and this physical impossibility was reputed to have occurred the day the ship's first—and, therefore, automatically, to the supplement mind, best-beloved of the ship—skipper had been retired. Since it was almost sure that the dice had not come to their place until well after that almost forgotten first master, and his children, had

found a peaceful rest, the sub-legend was sometimes the occasion of a quirk in Howe's upper lip, but it was interesting to note, nevertheless, that *Little Joe* had an apocrypha.

He removed his outer coat and draped it over the mate's control couch, while he himself sank down into the familiar texture and spongy response of his own chair and sat with his arms resting near the control levers. Idly, he flicked the medallion of the government seal on the main switches.

Yes, the ship has histories and historians, he thought, *some factual and some romantic, some accurate, others not*. The legend had begun to grow among the stars that were pencil-points on *Little Joe's* charts, and had multiplied as the stories were repeated.

We need a symbol, I think—men tend to think in personifications. It was a peculiarity of the race that it could conceive of such things as Platonism, or Absolute Truth, or even the vague restlessness of racial spirit that sent humanity journeying outward, spreading the starborne seed of man wherever the ships could reach. And, concomitant to this peculiarity was the parallel need of a symbol to embody the concept, as though, once created, the idea needed an easily comprehensive matrix to keep it clear and visible for the searching mind of man to hold firmly before him.

As he thought of it, he somehow doubted that, if all mankind's aspiration for the continued progress of human culture were to be reduced to metal, the result would in any way resemble *Little Joe*. But one could not be equally positive that if all the separate needs fulfilled in the construction of an interstellar vessel were somehow to be made visible, they would not resemble all the needs that were fulfilled in the growth of human civilization.

Men choose their symbols strangely, but they choose with precision, he thought.

Little Joe—a name born of whimsy on the part of the ship's first owner. Perhaps it was true that he'd built the ship with the winnings of one night at a craps table. But, most probably, this was but another fragment of apocrypha. The galaxy was large, and history is long. The yard that built *Little Joe* had never come forward to claim the distinction—the design had been a popular one, and who, now, could equate *Little Joe*, the symbol, with Hull Number K-357, or whatever code it had been. And this, too, was the proper basis for a legend.

He ran his hand over the grip of one of the control levers, feeling the coarseness under his fingertips where perspiration had etched the original molded finish of the composition. *Many hands*, he thought, *and many masters at the ship's helm. An old and honorable ship*. This, too, he recalled, came from a book read years before.

He looked out through a porthole at the field stretching away around the ship, lying empty today because it had been closed to traffic for the ceremony. Had it not been, he knew, the sky above the field would be bright with the flashes of incoming ships, and the tarmac would be dotted with spherical hulls.

His lower lip moved in a half-smile, and he discovered that he had actually patted the worn control lever with his comforting hand. The realization disconcerted him momentarily, until he considered that sentimentality was probably the strongest prerogative that a captain of *Little Joe* could command.

He reached out and patted the nearest pocket of the coat he had thrown over the mate's couch. The

manual was there, as he had expected; "Techniques of Gravitomechanical Astronautics," fresh in its Government Printing Office wrapper, with the slim envelope containing his orders tucked inside the flyleaf.

He sighed, remembering that it was for this that he had come out to the field so early in the morning, for it was only here, on the bridge of his ship, that the decision could be made.

He recalled that, at first, he had considered voluntary retirement when the orders standardizing the gravito-mechanical drive had been put through. Physiologically, he was still a young man, and the pension for which he was now eligible, together with his considerable savings, would never leave him in financial hardship. If he so chose, as his orders explicitly stated, he was free to retire without prejudice. If not, then he was to report to the designated training installation for instruction in the handling of the new drive.

A two-faced coin, he thought. The manual on the new drive had been included with the orders. He had gone through it carefully, wondering if his mind was still unrigid, whether the complicated new data could ever be learned to the degree of skill which his captain's conscience demanded. But, in the last analysis, it had been exactly the knowledge that so many men would leave space, feeling themselves too old or too inflexible to accept the change, that had persuaded him into remaining.

Perhaps the choice would not have been as complicated if he had not spoken to Martin, his Mate.

Martin had sat in the chair opposite him in his cabin, his aging face restrained from the show of any emotion, his voice deliberate.

"I don't see any but one way to look at it, John," Martin had said, keeping his lean body still in his chair.

"It's the same way it is with *Little Joe*, here. The ship's something like a symbol, the way the people say. It's like everything that human civilization has done or wants to do, poured into one shape and set off so people can see it, and feel what it means."

Howe had nodded. "I guess they're right about that."

"Well, all right, then. All you have to do is look at what they're doing."

"To the ship, you mean?"

"I mean putting *Little Joe* in the Smithsonian, where the ship'll always be there."

"For people to come and look at, and for kids to worship?" Howe had asked, dryly.

"I don't mean that's what I want for myself," Martin had said quickly. "Being worshiped is fine for *Little Joe*—the ship's earned it. But the way I see it, if they're retiring the ship, then it's time for the crew, too."

"Look, John," Martin had said, leaning forward for the first time, "we're at the top of the ladder. There isn't an officer in the Merchant Service who doesn't want these berths. But if they retire the ship, where do we go? I took a look at the insides of one of those bubble ships last week; hell, it'd be two years before I could find my way around in one."

"I guess, in a way, *Little Joe's* what we've been working towards all our lives. We're tied up to it, John. It's like I said—I can't see any but one way to look at it, and that's to quit here, at the top of the ladder."

"Maybe you're right," Howe had said then.

And *maybe you're right*, he repeated now, looking absently at the control banks, subconsciously reading the instruments that told him *Little Joe* was taut, fully fueled, and ready to have the controls unsealed for the last trip home. He pondered the thought that, when one's life was so closely

associated with a symbol, it was necessary to follow that symbol wherever it might go.

But that was something he might have accepted as valid earlier this morning, but with which he could not agree now.

It is not from sitting in museums that symbols rise, he thought. Even the eulogizers—the voices and faces on the telesolideo that told their innumerable stories about *Little Joe*, that recited “Old Ironsides,” and re-awakened the days when the pennies of schoolchildren had saved the *Constitution* from the salvage yard—even they, in their sentimental inaccuracies, had touched the source of the legend.

One of the first Interstellar freighters, the voice said again, and *Scout among the farthest frontiers of the human race*, *Pride of the Merchant Service*.

No, it was not from sitting in museums that symbols rose, for the greatness of *Little Joe's* legend rested in the fact that the ship had long and faithfully done the job which the designers intended. A ship was not a statue, nor an exhibit. There were silversided liners that poised gracefully in their berths, and snarling warcraft, but it was by the arcing freighters that the warp and woof of humanity were interlaced.

They're making a mistake, Howe realized. *What is the value of a cargo ship in the Smithsonian?* That had not been the function for which *Little Joe* was built—the ship belonged on the starways, plodding along on her intratomics, wrapped in the fragile cocoon of the A-F warp as she might be, and if she had to be retired, why, then, there were better memorials.

No, spaceships and spacemen belonged in space.

The thought struck him, and he tensed to the thrill of it. Andromeda! The message, twenty years old now, countless centuries older as it made

its tenuous way out of the nebula and crossed the dark barrier toward the First Galaxy, but a message nevertheless.

And the ship could make it; make it on inertia alone, the warp gone as the engines burned away the last fuel, but make it nevertheless, and if whatever Andromedans there were could send a message at the patient speed of light, why, then, the galaxy could respond in its own way—with *Little Joe*, a living symbol still.

But what is a symbol? The thought came, and he relaxed his hands. He sat in his chair, and remembered his thoughts of this morning. *We need a symbol, I think—men tend to think in personifications.*

That was part of it. But what else had he thought, here on his bridge?

It was a peculiarity of the race, he remembered, that it could conceive of and live by abstract concepts, but it was a concomitant trait that there was a parallel need for a symbol to embody the concept, a matrix to keep it clear and visible.

And so, the thought came to him, it is not *Little Joe* that is important, for, as long as the concepts remain, there will be other symbols, each equally valid. It is the concepts themselves that must be maintained, and this is the important task.

He slapped his hand once more, affectionately, on the control handle.

“You’ll forgive me for calling you a braw bonny lass again, *Little Joe*, and for not giving you a run to Andromeda,” he said aloud, and picked up his coat.

He reached into the pocket and pulled out his orders and the manual. He leafed through the closely printed pages once again, paused to look at the complex diagrams.

There was work there—hard work, and much to learn. But the GM drive and the bubble ships were out among

the stars, edging the line where outer dark began, and before he was through he'd be out there with them, a skipper again, with his own command.

And the not outrageous thought came to him that perhaps the Andromedans might soon have an answer to their message—a surer, swifter answer than *Little Joe*, unmanned, and drifting at random, could ever have brought.

Moving quietly through the narrow companionways, he left the ship, and walked back across the tarmac.

The same guard who had let him in at dawn was still at the gate. As he walked toward him, Howe thought: *Anderson?* A stoker on the *Maybank*, the sentry had said. He looked closely at the young features as he walked toward the man. It would have to be an older brother. He superimposed lined tautness and a deep tan on the guard's boyishness, and the eye-creases acquired from hours of peering at flowmeters.

A face emerged from the montage, and with it a voice and individuality. He smiled inwardly.

The guard pulled the gate open. "You'll be coming back later for the ceremony, won't you, sir?" he asked.

"Certainly. I couldn't very well miss that, could I?" He smiled.

The guard brightened in response. "No—I guess you couldn't, sir."

"What's your first name, Anderson?" Howe asked.

"Peter, sir."

Howe shook hands with the guard. "Glad to know you, Pete. Tell Eddie

I said hello. Does he still know all the verses to 'The Song of the Wandering Spaceman'?"

"Sings them at the top of his lungs every Saturday night, sir," the guard said. He was trying to grin in a comradely fashion, but Howe felt a flush prickling the back of his neck at the awe in his eyes.

"Well, thank you for letting me in," he said with a vague feeling of embarrassment. "Good-by."

"Good-by, sir. Good luck!"

Howe walked back to his car, the corners of his mouth twitching slightly at the enthusiasm of that last benediction.

He climbed into his car, turned it around, and began to roll away. Strange, the way the guard had treated him—and the stoker, Anderson; had he really been so proud of his service aboard the *Maybank* that, out of all the captains the man must have served under, it had been Howe that he chose to tell his kid brother about?

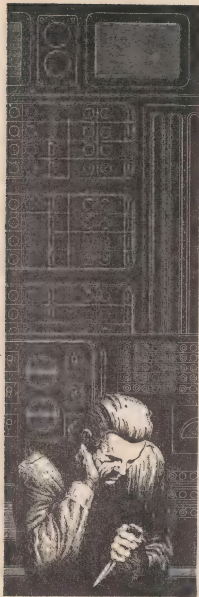
What makes a symbol? he wondered.

He shook his head in puzzlement. Why? He'd never done anything more than the things a captain's job demanded—no heroic missions, no spectacular runs.

He shifted his eyes to the rear-view screen, and felt a momentary shock.

The guard was a Marine, and Howe was a Merchant Service officer, but for some reason the man had stepped out into the road, looking after Howe's car, and had snapped into rigid salute. He was still holding it as the car dipped over the crest of a hill and Howe could no longer see him.





HUMPTY DUMPTY

By LEWIS PADGETT

The advantages a telepathic race would have are fairly obvious. But the privilege carries an obligation; for every right, there is a duty, and the possession of power is suicidal unless wisdom accompanies it!

Illustrated by Freas

And God said to Noah, the end of all flesh is come before Me; for the earth is filled with violence through them . . .

UNDER a stone sky Jeff Cody stood, his hands clasped behind him. He was trying to read the mind of an electronic calculator, and trying to keep his own mind from being read with all the violence in it. He shut down all his barriers around his own desperation, pushed hard upon the one thought he did not dare to face. He held it down, trying to drown it under the surface turmoil of his mind. The calculator had a broad, bland, glassy brow, winking with lights and reflections. Somewhere inside it a thin slice of crystal lay that could wipe human life off the face of the planet. Not Jeff Cody's life, and not the life of his people—but all human, nontelepathic life. The responsibility for the crystal was one man's. Cody's.

Behind him Allenby shifted from

one foot to another, his reflection blurring in the shining surface of the calculator's control panel. Cody said without turning,

"But if the Inductor is a failure, then we'll have to—" An image of death and dying formed like a cloud in his thoughts.

He had not said this aloud. Allenby interrupted very quickly, not speaking aloud either, but his thoughts cutting into Cody's, ending it before the image of destruction could take full shape in Cody's mind.

"No. We've had another setback. But we'll try again. We'll keep on trying. We may never have to use—that." His mind sketched in the thin crystal in the calculator, with death for most of the race of man locked in it.

"Call it setback or call it failure," Cody said, in the silence of his mind. "The goal's too high. Nobody knows what makes a man telepathic. Nobody's ever going to induce it with a machine. No Inductor will ever work. You know that."

"I don't know it," Allenby's thought said quietly. "I think it can be done. Jeff, you're under too much pressure."

Cody laughed shortly. "Merriam lasted three months in this job," he said. "Brewster stood it longest—eight months. This is my sixth month. What's the matter? Afraid I'll resign the way Brewster did?"

"No," Allenby said. "But—"

"O.K.," Cody interrupted the thought irritably. "Forget it." He felt Allenby's mind touch the edges of his with tentative, uneasy brushing motions. Allenby was a psychologist. And therefore Cody was a little afraid of him. He did not want expert attention brought to bear on him just now. There was something terrifying and yet very tempting down close under the surface of his thoughts, and he did not mean to expose it just yet to

anyone. He made an effort of the will and summoned up a shimmer of pleasant images like a smoke screen to puff in Allenby's face. Pine woods with warm rain blowing through them, a quarter of a mile over their heads above the limestone sky. The quiet and clearness of the empty heavens broken only by the buzz of a helicopter and the soft, continual swish of its vanes. The face of Cody's wife when she was in a good mood and laughing gently.

He felt Allenby's uneasiness tentatively subside. He did not turn as he heard Allenby's feet shift on the floor.

"I'll get back, then," Allenby said without words. "I just wanted to see you when I told you that we'd hit another dead end. Is it all right, Jeff?"

"Fine," Cody said. "I won't keep you."

Allenby went out.

Cody listened while the receding footsteps crossed the room beyond. He heard the door close and lock. He was alone now, physically, though all through the cavern an interlacing play of telepathic thoughts moved continually, touching his own and passing. Even Allenby sent back a vague uneasiness as he moved away. So Cody kept the images of pine woods and clear sky and laughing women playing over the surface of his mind. But his eyes turned sidewise and without moving his head he saw lying on the edge of a work table within reach of his hand the thing he had not dared admit into his mind till now. Too many other minds were watching.

What he saw was a knife with a heavy, narrow blade and a sharp point, left by some careless workman. What he thought of was the man before him in his job, and the way Brewster had resigned from it after eight months. Brewster had used a revolver. But a knife was good, too.

There is a place inside the collarbone, near the neck, and consciousness goes out like a blown candle in a matter of seconds if you drive the knife in there. If your burden is too much to bear, as Merriam's was, and Brewster's. And Jeff Cody's.

All around him in the air, like an eyeless, invisible staring, uneasy telepathic minds were swinging around toward him. A ripple of panic was running through the cavern. Something, somewhere, was wrong. But Cody had controlled his surface thoughts skilfully. He had not let himself really see the knife, really think clearly of that spot inside the collarbone, until now.

Now he drew a deep breath and let the wonderful release of the thought flash bright and clear through the cavern. They couldn't stop him. Nobody was near enough. He was free.

"So the Inductor won't work," he said aloud. "So you can't induce telepathy in a human mind. But there's one way to stop telepathy!"

He took one long sidewise step and the knife was in his hand. With two fingers he felt for the ridge of his collarbone, to guide the blade.

"Let the Inductor fail," he thought. "Let the pogrom come. Let the race die. Turn loose Apocalypse. It's not my problem now!"

Generations ago, the Blowup had posed the problem by mutating subspecies of telepaths. And there had been a time when the Baldies hoped that eugenics could solve that problem. But not any more. Time was too short.

Even though the telepathic function was carried by a dominant gene, there were too few Baldies. Given enough time and enough intermarriage, the world might become peopled entirely by telepaths, but there was not enough time. The only answer was the one

which Baldies had been seeking for years now—a mechanical device, an Inductor, which would induce the telepathic power in a nontelepath.

It was theoretically possible. The minds of the greatest scientists on earth lay open to the Baldies. And here in the caves the electronic calculator could solve the problem, given enough data. But this problem it had not completely solved, for there was not enough data, in spite of the treasure of knowledge stolen from hundreds of brilliant, seeking, non-Baldy minds.

Still, it was the answer. If every man and woman in the world could become a telepath, simply by wearing a compact mechanical device, the miracle could be worked. The last barriers would go down. The fear and hatred nontelepaths had for Baldies would vanish—not instantly, but it would dissolve little by little in the great sea of interacting minds. The walls, the *difference*, would vanish, and with it the fear that relentlessly forced the coming of the pogrom.

But the Inductor was still a theory. The calculator had not yet solved that problem, if it ever would. Instead, it had given the answer to the basic problem in an unexpected way, coldly mechanical and terribly logical. The problem could be solved, the calculator said. Destroy all nontelepathic humans. The method? It searched its vast memory-library and found—

Operation Apocalypse.

There was a virus which, by means of certain stimuli, could be mutated into a variant which was air-borne and propagated quickly. It destroyed human neural tissue. There was only one kind of human neural tissue it could not harm.

Telepaths were naturally immune to the mutated virus.

No Baldy knew what the virus was, or the method of mutation. Only the

calculator knew those things, and the inhuman mind of an electronic calculator cannot be read. Somewhere in the great machine was a tiny crystal of barium titanate bearing a series of frozen dots of energy in a binary digit code. And that code held the secret of the deadly virus.

If Jeff Cody took three steps forward and sat down in the cushioned operator's chair before the control panel, and if he touched a certain button, a monitor device would examine the electronic pattern of his brain and identify it as surely as fingerprints are identified. Only one man in the world could satisfy the question the monitor would silently ask.

And then a light would begin to glow — somewhere — on the control panel, and under it would be a number, and, seeing that number, Cody could make the calculator reveal its secret. Before Cody, Brewster had carried this crushing burden. And before Brewster, Merriam. And after Cody—someone else would have the unendurable responsibility for deciding whether to say: *The end of all flesh is come before Me . . . behold, I will destroy them with the earth.*

The crash of protesting minds burst by sheer force through the shell of defense Cody had put up around his own as he took up the knife. From all over the busy cavern telepaths stopped in their tracks and hurled their strong urgent thoughts toward the interlocked center that was Cody.

It was stunning. He had never felt so strong an impact before. He did not mean to falter, but the burden of their protest was almost tangible, almost a thing to stagger under. Even from above-ground he could hear and feel the instant thrust of down-driving thought. A quarter of a mile above this limestone sky, above the rock and the soil with the pine tree roots

clenched downward through it, a hunter in ragged buckskins paused among the trees and sent his own shocked, sympathetic protest dropping toward the cavern. The thought came blurred to Cody by the stone between, and starred with the tiny, bright, brainless thoughts of small burrowing things in the soil overhead.

Someone in a helicopter high up in the hot blue sky locked minds with the group underground, faint and far-off, but as instant as the man in the nearest cave beyond Cody's locked door.

"No, no," the voices said in his mind. "*You can't! You are all of us. You can't. Jeff, you are all of us!*"

He knew it was true. The way out was like a deep, dark well, and vertigo pulled him toward it, but he knew that he would be killing his whole race, a little, if he killed himself. Only telepaths can experience death and still live. Each time a telepath dies, all the rest within mind's reach feel the blackness close upon an extinguished mind, and feel their own minds extinguish a little in response.

It happened so fast Cody was still feeling with two fingers along the edge of his collarbone, and the knife was not yet firm in his fist, when the single, interlocking cry of anguished protest from a hundred minds speaking as one closed down upon him. He shut his thoughts and was obdurate. He could fight them off long enough. This would only take a second. The door was locked and physical force was the only thing that could stop him.

But he was uneasy even in this urgent press of voices and action. For Allenby's mind was not speaking with the rest. Why?

Now the knife was firm in his hand. Now he spread his two fingers apart a little to make way for it, knowing the place to strike. Had Brewster felt as he felt, when Brewster stood here six

months ago and laid down the unbearable burden of decision? Had it been hard to pull the trigger? Or easy, as it was easy to lift the knife and—

A burst of blinding white light exploded in the middle of his brain. It was like a shooting star that crashed and shattered upon the very texture of the mind itself. In the last winking instant of consciousness Cody thought he had already struck the self-destroying blow and that this was what death looked like from within.

Then he knew that the meteor of impact was Allenby's mind striking him a numbing blow. He felt the knife slip from his hands, he felt his knees buckle, and he felt nothing more for a very long, an immeasurable time.

When he was aware of himself again Allenby was kneeling beside him on the floor, and the calculator looked up above him glassy and reflecting from an unfamiliar angle, a child's eye view seen with a knee-high vision. The door was unlocked and stood open. Everything looked strange.

Allenby said, "All right, Jeff?"

Cody looked up at him and felt the pent-up and unreleased tension in him boil toward the surface in an outburst of rage so strong that the supporting minds he felt hovering around him drew back as if from fire.

"I'm sorry," Allenby said. "I've only done that twice before in my life. I had to do it, Jeff."

Cody threw aside the hand on his shoulder. Scowling, he drew his feet under him and tried to rise. The room went around him in an unsteady circle.

"Somebody had to be the man," Allenby said. "It was the odds, Jeff. It's hard on you and Merriam and Brewster and those others, but—"

Cody made a violent gesture, cutting off the thought.

"All right," Allenby said. "But don't

kill yourself, Jeff. Kill somebody else. Kill Jasper Horne."

A little burning shock went through Cody's mind. He stood motionless, not even his mind stirring, letting that strange new thought glow in the center of it.

Kill Jasper Horne.

Oh, Allenby was a wise man. He was grinning at Cody now, his round, ruddy face tense but beginning to look happy again.

"Feeling better? Action's what you need, Jeff—action, directed activity. All you've been able to do for months is stay put and worry. There are some responsibilities a man can't carry—unless he acts. Well, use your knife on Horne, not yourself."

A faint flicker of doubt wavered in Cody's mind.

Allenby said, "Yes, you may fail. He may kill you."

"He won't," Cody said aloud, his voice sounding strange to him.

"He could. You'll have to take the chance. Get him if you can. That's what you want to do, but you haven't really known it. You've got to kill someone. Horne's our basic problem now. He's our real enemy. So kill Horne. Not yourself."

Cody nodded without a word.

"Good. We'll locate him for you. And I'll get you a copter. Will you see Lucy first?"

A little wave of disturbance ran through Cody's mind. Allenby saw it, but he did not let his own mind ripple in response. Quietly the innumerable linking minds of the other telepaths all around them had drawn back, waiting.

"Yes," Cody said. "I'll see Lucy first." He turned toward the door of the cave.

Jasper Horne—and what he represented—was the reason why the Baldies could not let even themselves

learn the method of Operation Apocalypse and the nature of the deadly selective virus from the calculator. That secret had to be kept from Jasper Horne and his fellow paranoids. For their approach was: *Why not kill all the humans? Why not, before they kill us? Why not strike first, and save ourselves?*

These were hard questions to answer, and Jasper Horne was very adept at putting it to the test. If you could say the group of paranoid telepaths had any leader, then Horne was that leader. How much the man knew of the Caves was uncertain. He knew they existed, but not where. He knew some of the things that were going on in it, in spite of the frequency-scrambling Mute helmets every Cave Baldy wore. If he knew about the Inductor, he would—if he could—have dropped an Egg on it with the greatest joy in life and watched the smoke-cloud arise. Certainly he knew that Operation Apocalypse had been planned, for he was doing his best to force the Baldies to release the virus that would destroy all nontelepathic human life.

And he knew the way to force this decision. If—when—a total pogrom started, then the virus and the Apocalypse would be loosed upon the world. Then there would be no choice. When your life depends on killing your enemy, you don't hesitate. But when the enemy is your brother . . .

That was the difference. To the normal Baldies, the race of nontelepathic humans was a close kin. To the paranoids they were hairy sub-men fit only for extermination. So Jasper Horne worked in every way he knew to force trouble to the surface. To precipitate a pogrom. To make sure the Baldies released the virus and destroyed the hairy men.

And Horne worked in a decentralized post-Blowup society founded on

fear, a fear that had been very real once. Today, no further move seemed possible. The society wavered between re-contraction and further expansion, and each man, each town, was on guard against all others. For how can you trust another when you do not know his thoughts?

American Gun and Sweetwater, Jensen's Crossing and Santaclare and all the rest, clear across the curve of the continent. Men and women in the towns going about their business, rearing their children, tending their gardens and their stores and their factories. Most of them were normal human beings. Yet in every town the Baldies lived too, rearing *their* children, tending *their* stores. Amicably enough for the most part. But not always—not always.

And for weeks now, over most of the nation, had lain a humid, oppressive heat wave, in which aggressions rose steadily higher. Yet, outside of a few knife-duels, no one dared strike the first blow. Other men were armed too, and every town possessed a cache of atomic Eggs, and could strike back with deadly precision.

The time was more than ripe for a pogrom. So far, no mob had formed. No potential lynchers had agreed on a target.

But the Baldies were a minority.

All that was needed was a precipitating factor—and the paranoids were doing their best to provide that.

Cody glanced up at the cavern's gray stone sky and reached with his key, for the lock of his wife's apartment door. With the key already in place, he hesitated, not from indecision this time but because he knew what probably waited inside. There was a furrow between his brows, and all the little lines of his face were pulled tense and held that way by the perpetual tension that held every Baldy



from the first moment after he entered the caves.

The stone sky held down and bottled in such a complex maze of thoughts, echoing off the walls and interlacing and interlocking in a babel of confusion. The Cavern of Babel, Cody thought wryly, and turned the key with a gesture of small resolution. Indoors he would exchange one babel for another. The walls would give him a little shelter from the clouds of stale, sullen resentment outside, but there was something inside he liked even less. Yet he knew that he could not leave without seeing Lucy and the baby.

He opened the door. The living room looked bright enough, with its deep, broad divan-shelf running along three sides, soft, dark mossy green under the shelves of bookspools, colored cushions scattered, the lights on low. An electric fire glowed behind a Gothic interweaving of baffles, like a small cathedral on fire from within. Through the broad window in the fourth wall he could see the lights of

the Garsons' living room next door reflecting on the street, and across the way June and Hugh Barton in their own living room, having a pre-dinner cocktail before their electric fire. It looked pleasant.

But in here all the clear colors and the glow were clouded by the deep miasma of despair which colored all Jeff Cody's wife's days, and had for—how long now? The baby was three months old.

He called, "Lucy?"

No answer. But a deeper wave of misery beat through the apartment, and after a moment he heard the bed creak in the next room. He heard a sigh. Then Lucy's voice, blurred a little, said, "Jeff." There was an instant of silence, and he had already turned toward the kitchen when her voice came again. "Go into the kitchen and bring me a little more whiskey, will you, please?"

"Right away," he said. The whiskey was not going to hurt her much, he thought. Anything that could help her get over the next few months was that

much to the good. The next few—? No, the end would come much sooner than that.

"Jeff?" Lucy's voice was querulous.

He took the whiskey into the bedroom. She was lying face up across the bed, her reddish curls hanging, her stocking feet against the wall. Marks of dried tears ran down across her cheek toward her ear, but her lashes were not wet now. In the corner the baby slept in a small cocoon of his own incoherent animal-like thoughts. He was dreaming of warmth and enormous all-enveloping softness that stirred slowly, a dream without shape, all texture and temperature. His light-red curls were no more than a down on his well-shaped head.

Cody looked at Lucy. "How do you feel?" he heard himself asking inanely.

Without moving a muscle she let her eyes roll sidewise so that she was looking at him from under her half-closed lids, a stony, suffering, hating look. An empty water glass stood on the bedtable within reach of her lax hand. Cody stepped forward, unstopped the bottle and poured a steady amber stream into the glass. Two inches, three. She was not going to say when. He stopped at three and replaced the bottle.

"You don't have to ask how anybody feels," Lucy said in a dull voice.

"I'm not reading you, Lucy."

She shrugged against the bedspread. "You say."

Looking again at the sleeping baby, Cody did not answer. But Lucy sat up with great suddenness, making the bed groan, startling Cody because the motion had been so spontaneous he had not even caught the anticipation of it in her mind. *He's not yours. He's mine. All mine, my kind, my race. No—the thought went on—taint in his blood at all. Not a freak. Not a*

Baldy. A nice, normal, healthy, perfect baby— She didn't say it aloud, but she didn't have to. She caught at the thought halfway through, and then deliberately let it go on, knowing she might as well have said it aloud. Then she added in a flat voice, "And I suppose you didn't read *that*."

Silently he held out the whiskey glass to her.

It had been five years now since the Egg dropped on Sequoia. Five years since the cavern colony saw the last daylight they might ever see. And the people herded from Sequoia to the caves had settled down sullenly, resentful or resigned according to their temperaments. They had every comfort of underground living which their captors could provide. They were as content as skilled psychologists could make them, psychologists who could look into their minds and read their needs almost before the needs took shape. But they were captives.

The intermarriages had started within a few months of the captivity. It was one of the large-scale experiments which could have happened only in the caves under such controlled conditions. Partly it was to demonstrate good intent to the captives, to make them feel less isolated.

No telepath really wants to marry a nontelepath. There are among nontelepaths quite as high a percentage of desirable mates as among Baldies, but to a Baldy, a nontelepathic human is a handicapped person. Like a lovely young girl who has every desirable attribute of mind and body, but happens also to be deaf, dumb, and blind. She may communicate in finger-language, but the barrier remains all but insurmountable.

And there is this added factor—around every human who starts out life with the best of heredity and

environment, shadows of the prison-house are inevitably, slowly but inexorably closed in by all the problems of living which he fails to solve completely without even realizing it. But not the Baldies. There are always friends to help, there are always minds to lean upon in crises and uncertainties. There is constant check and balance, so that no Baldy suffers from those inward quandaries, those only partly recognized clouds of confusion and bewilderment which fog the happiness of every other human being. In the telepathic mind there are comparatively few unswept chambers cluttered with old doubts and fears. It makes for a clarity of the personality which no nontelepath quite achieves.

A telepath may become psychotic, of course, but only when subjected to such stresses, over a long period of time, as a nontelepath could endure only briefly without breaking. (The paranoid telepaths were in a different class; heredity was an important factor there.)

So marriage between Baldy and nontelepath is, at best, marriage between an alert, receptive, fully aware being and one murky and confused, handicapped in communication and always, on some level, latently resentful.

But by now almost every marriageable nontelepath in the caverns had been painstakingly courted by and married to a Baldy. They were at the same time, of course, inevitably married to an espionage agent, a willing but not always accepted psychoanalyst, and, most importantly, to the potential parent of other Baldies.

The gene is dominant, which means that the children were almost invariably telepathic. Only when the Baldy spouse possessed one recessive nontelepathic gene as well as one dominant telepathic gene could the child be born a nontelepath.

That was what had happened to Lucy and Jeff Cody—

No human was ever to leave the caves again. No Baldy was to know of the captivity who did not wear the Mute helmet, since if the world ever learned of this captivity, the long-awaited pogrom would touch off automatically. No child of human parents would ever leave, unless it left as an infant in arms, too young to remember or tell the story. But a telepath child was a recruit at birth to the ranks of the captors. The hope had been that in a generation or two the captives could automatically be blended with the Baldies or taken out of the caves at infancy, so that the colony would once more revert to its original state of a population composed only of telepaths.

That had been the original plan, but growing pressures had already made it obsolete.

Lucy wiped her mouth on the back of a lightly tanned hand and held out the emptied glass to Cody. She waited a moment while the whiskey burned its way down and spread in a slow, hot coating over the walls of her stomach.

"Take a little," she said. "It helps."

Cody didn't want any, but he tilted a short half-inch into the glass and drank obediently. After a time Lucy gave a short sigh and sat up cross-legged on the bed, shaking the hair back from her eyes.

"I'm sorry," she said. "Irrational."

She laid her hand palm up on the bedspread and Cody closed his own hand over it, smiling unhappily at her.

"I've got an appointment outside," he said. "I'll have to leave in a few minutes, Lucy."

Her look shot wild and unguarded toward the crib in the corner. Her thought, at once blurred and clarified by the release of alcohol, unfurled like a flag. Cody almost winced at the

impact of it, but he was even more schooled in discipline than most Baldies, being husband to a nontelepath, and he showed nothing. He only said, "No. It isn't that. I won't take him until you say so."

She gave him a sudden startled glance.

"It's too late?"

"No," Cody said quickly. "Of course not. He isn't old enough yet to remember—this."

Lucy moved uneasily.

"I don't want to keep him down here. You know I don't. It's bad enough for me, without knowing my own son wouldn't ever—" She shut off the thought of sunlight, blue air, distances. "Not just yet," she said, and pushed her feet over the edge of the bed. She stood up a little unsteadily. She gave the baby one blind glance and then walked stocking-footed toward the kitchen, bracing herself against the wall now and then. Cody reached automatically toward her mind, then drew back and got up to follow her. She was at the kitchen sink splashing water into a glass. She drank thirstily, her eyes unfocused.

"I have to go," Cody said. "Don't worry, Lucy."

"Some . . . woman," Lucy said indistinctly over the edge of the glass. "There's . . . somebody. I know."

"Lucy—"

"One of *your* kind," Lucy said, and dropped the glass in the sink. It rolled in a bright arc, spilling water.

All he could do was look at her helplessly. There was nothing he could say. He couldn't tell her he was on his way to try to kill Jasper Horne. He couldn't tell her about Operation Apocalypse or the Inductor or the position of fearful responsibility he held. He couldn't say, "If we can perfect the Inductor in time, Lucy, you can go free . . . you and our child." Nor could he say, "I may have

to kill you . . . you and our child and every nontelepath on earth . . . with Operation Apocalypse."

No, there was nothing he could say.

She drew a wet hand across her face, pushing back her hair, looking up at him blurrily, and then came on uncertain, shoeless feet across the kitchen to lay her cheek on his shoulder and push her arms under his, around his chest.

"I'm sorry," she said. "I'm . . . crazy. It's hard for you too, Jeff."

"Yes."

"We'll send the baby away next week," she promised. "Then I'll be sane again. I . . . I *hate* whiskey. It's just that—"

"I know." He smoothed the hair away from her wet face, tried to find words for the complex waves of love, pity, remorse, terror and pain which filled his mind constantly as long as he was with his wife, or thinking of her. It is curious that telepaths are often almost inarticulate when it is necessary to communicate nuances of feeling in words. They never need to use words, among their own kind.

"Be patient with me, Lucy," he said finally. "There's trouble coming. There isn't much time, and I may fail. I . . . I'll come home as quickly as I can."

"I know you will, dear. I wish I could do . . . anything."

He held her.

"I'll bring you something you'll like," he said. "A surprise. I don't know what yet, but something nice. And Lucy, after . . . next week . . . if you mean it, we'll move if you want. Find a new apartment over in Caye Seven. You can order new furniture, and we'll—" He scarcely knew what he was saying. Illusion and reality were too confused.

"We'll think of something, dear," she said. "It's all right."

"I'll go, then," he said.

She nodded. "I'll miss you. Hurry back."

Cody shut the grille of the lift behind him and leaned his head against the steel wall, slumping wearily as he shaped in his mind the code-signal to activate the mechanisms. A pre-occupied mind somewhere responded with another segment of the cipher, and a third—someone going by rapidly, late to dinner—tossed in the necessary remaining symbols. Three mental images had to be projected simultaneously to operate the lift. It was a precaution. Escape exits could be operated by telepaths only.

He pushed a slanting door open into a welter of dripping leaves and the sharp, sweet odor of wet pine and rain. A startled rabbit exploded out of the underbrush. Cody shut the camouflaged portal and looked up, squinting against the rain that drove in his face. From somewhere above a voiceless greeting came, a motor hummed and a dark coil rolled smoothly down out of the grayness. Cody set his foot in the stirrup and felt the soft instant upward lift of the basket seat snatching him aloft as he sank into it. The hovering copter received him through a single gaping jaw and carried him upward.

Arn Friedmann did not glance back from the controls. He did not need to. Short, squat, gravely expressionless in face and in manner, he leaned his dark-capped head forward to peer through the rain, his mind detaching enough of itself from attention to the business at hand to send a wordless greeting.

For a moment Cody only leaned back and let the cool, untroubled silence of the open sky wash his mind clean. It was like allowing long-taut muscles to relax at last. The cavern was so filled with closed-down resentments, guilts and fears and tensions

that after a while even the air became hard to breathe, for a telepath.

Friedmann had something urgent he wanted to convey. Cody felt the touch of it on the outer edges of his awareness, waiting, letting the newcomer breathe clean air a while. Friedmann's mind hovered as the copter had hovered, patient, abiding the signal.

Under them the pine woods swept backwards, tossing, rain-blurred. Water ran down the panes. The motor hummed pleasantly in the coolness. Lucy. Five years now without sight of rain or trees or sky. A lifetime ahead of her without them, or else a quick death, or—the Inductor.

"We've got to have more time," Friedmann's thought came. "If a pogrom starts now, it'll spread. I think the paranoids are counting on that. They've been filtering into the key towns—the places where riots would be apt to start. Like American Gun. Jasper Horne's there."

"Since when?" Cody asked.

"Three weeks or so. And he's been working hard. You know how the paranoids do it. Read a mind and drop a loaded word at the right time, to keep the tension building. Probably Horne could start a riot in American Gun any time he liked, by now."

"Not if he's dead," Cody's thought said, with grim anticipation. He leaned back watching the mists scud past, thinking of American Gun. It was a gambling town. That was the specialty, anyway, although there was a famous research laboratory in the town, and a master artisan in plastics lived there. But basically men came to American Gun to gamble.

That's what I'll be doing, Cody thought. He watched sunlight dry the raindrops on the window beside him.

Friedmann left Cody at the outskirts of American Gun and sent the

copter hurrying east. He had an errand of his own in the town of Bleeding, Kansas, five hundred miles away. Cody watched the copter lift in a perfectly empty blue sky.

American Gun lay in a great flat half-saucer rimmed by rising hills and cut across and bounded by a broad, slow river. There were a number of distant toothpick figures on the beach, and a variety of boats on the river, transparent plastic canoes and skiffs glinting in the sun. Dark dots against the placid green indicated swimmers. But the wind blowing up from the river was hot.

Cody stood on the lower foothills, looking down over American Gun. A certain calm relaxed him, now that he was moving directly toward a clearly-seen goal. There were in the town perhaps a hundred buildings, few of them large, and none close to the others. Trees flourished, or would have if their leaves had not drooped limply—all but the ones near the river bank. Only children were moving fast. Under a live oak Cody could see a little party around a spread white rectangle, having a picnic. Against the white cloth he could see the green and red of watermelon.

A small white dog trotted slowly past him, its tongue lolling. It gave him a bored but wary glance. In its mind was a dim image of a frightful, slaving beast somewhat larger than a tiger. With some difficulty Cody identified the Terror as a dachshund whom the small white dog feared.

Somewhat diverted, Cody began to descend the slope toward American Gun. He didn't hurry. The moist, warm air was pleasant against his skin. Unthinking, receptive, for the moment, he let the crosscurrents of thought sweep like the sound of a sea through him, while he moved on in half-hypnotic rhythm, focusing on a long Byzantine-style building ahead,

and watching it grow larger, step by step.

... There was room enough on earth. And surely there were enemies enough besides other men. Man had been fighting a war ever since he stood upright, and there had never been any armistice declared against the oldest enemy of all, the enemy that burned in the hot blue sky, that hid, rod-shaped, toxic and invisible, in the soil, that ebbed now in the river but could rise and flood, the enemy that went on unknowing and unheeding man, whose ancient power always pounded at the dike man's intelligence had built.

Enemy and friend at once—this gift of the gods. Without it, without the physical and chemical forces which had built this air, this water, this shallow valley of fertile loam, there would have been no life at all. A fairy gift—this planet. Guard it, keep it, watch it—learn to predict and control it—and it will serve you. Forget it while you fight among yourselves, and the burning sun, the flooding waters, the deadly cold, and the fecund micro-organisms will work as they have always worked, in their old pattern, and in that pattern there is no planned place for man. How like a god!

By now Cody was at the little park before the long Byzantine building. Trees were wilting above brownish lawns. A shallow rectangular pool held goldfish, who gulped hopefully as they swam to the surface and flipped down again. The little minds of the fish lay open to Cody, minds thoughtless as so many bright, tiny, steady flames on little birthday candles, as he walked past the pool.

He did not enter the Byzantine building. He had not intended to, physically. Instead, he turned toward one of the shoulder-high pedestals set in irregular rows along the front of

the building and stopped before one that was not in use. A few men and women had their heads bowed over the pedestals, peering into eyepieces. Not many. It was too hot, even here in the shade.

Cody bent over the eyepiece of his pedestal, found a coin in his pocket, and pushed it into the slot. The blackness at which he stared turned into a pattern of bright letters: *Radio-cobalt*. Then a series of number-ranges appeared, one by one. At random Cody pushed the button that indicated his choice. That started the mechanism. He found himself looking into a magnified Wilson cloud chamber, streaked with flashing trails of subatomic activity. Just above the image a counter ticked off the number of electronic collisions. If his guess had been accurate enough, he might win the jackpot, and prove—

Nothing. Nothing at all. But as Cody's mind began to range, he felt the eager, troubled anticipation in the minds around him, and realized that to win, for most of these others, would prove a great deal.

For, basically, those minds held no confidence at all. Over all of them lay the heavy threat that had shadowed the world since the Blowup and put an irresistible weapon in every hand, a cache of Eggs in every town. Instead of national walls, there was now a wall around each town—and around each individual. Survival still depended on luck—blind change.

And so the gambling towns, like American Gun, flourished. Here, at the casinos, at the slot machine, at roulette and craps and chuck-a-luck and faro, men could prove that the blind goddess favored them, and that they were still safe. The social uncertainty was shifted to the mechanical uncertainty of the fall of dice or the spin of a wheel, and personal responsibility was shifted to the hands of the

lady the Greeks called Tuche and the Romans, Fortuna.

Cody felt people moving past him, in and out of the casino. To his sensitive mind the hot air seemed to spark. Perhaps that was because of the steadily mounting tension spreading from no source a human could identify and which no human could ignore. But Cody knew the source. Jasper Horne had not been in American Gun for weeks without a purpose.

Here, if anywhere, the pogrom could be started.

And here, in American Gun was the force which had driven Cody helplessly into his dilemma, relentlessly forcing him towards the choice that no man could contemplate for too long without seeking some easier answer. Here was the pressure which had forced his hand to the knife, and the knife to his neck. And here, too, was the man who was responsible.

Jasper Horne, Cody thought as the flashing streaks of the cloud chamber burned before his eyes. His mind polarized toward that goal with a deadly intentness. Allenby, back in the Caves, had been right. To kill Horne, not himself, was the real goal for Cody—because that would risk merely his own life; it would not mean betrayal of his own people by dropping the responsibility he carried for all of them. The paranoids had been the enemy, from the very beginning. Always they had worked to destroy the acceptance of the Baldies by the rest of mankind. They were the ones who had caused the destruction of Sequoia, and the need to keep humans captives in the Caves. Had that not happened, he would probably have never met Lucy, and she would be happier now, and so would he. Now, no matter how hard both of them might try, there could never be any real answer for them, or for their child. There was no way out. No matter

what happened, there were wounds that could never heal.

The earth itself was both enemy and friend. But the paranoids were all enemy, and of them all, Jasper Horne was somewhere here in American Gun, within Jeff Cody's reach—a man to be killed, if for no other reason, than because he and his kindred paranoids had made the Baldies killers.

The glittering streaks of light in the cloud chamber died. The viewer went dark. Cody had won nothing. He slipped another coin into the slot and again watched the electronic bombardment, while his mind ranged and closed in toward his quarry.

Within the Byzantine building a flurry of thoughts whirled like the roulette wheels. This was a gossip center for American Gun. Here, now and then, he caught images which he identified with Horne. Gradually he tested these thoughts, like directional antenna, until a picture of Horne's

habits began to clarify. But other things clarified as well—the mounting pressure of events in the town which no nontelepath connected with the paranoid's presence.

No one in American Gun had shaved for twenty-four hours. Oh, some had—but not many. The Baldies had no need to shave, and, of course, there were humans courageous enough to risk suspicion. In the nearby research laboratories the no-shaving movement



had not taken hold. And there were others, but not many, and those with smooth chins often moved in a circle of suspicious glances and left trails of hostile murmurings behind them.

So it might be doubly difficult to kill Horne. Violence could be the move that touched off the pogrom—exactly what Cody had hoped to avoid by eliminating the paranoid. That meant Horne would have to be killed privately, above all, away from any potential mob leaders who might trigger a riot. (There were such men in American Gun; Horne had found them already. They would be the ones to lead the mob when the time came.)

He's at the Last Chance.

Cody lifted his head, dazzled for an instant by the deep blue shadow and the white sunlight. His mind mapped a picture of American Gun from the data he had already gathered. The Last Chance would be at the north end of town, near the research laboratories. Horne might or might not still be there, but it would be easy to pick up his trail.

Cody skirted the goldfish pool, past the tiny flickering flames of the small, drifting minds, and took a path leading northward through the town. His thoughts continued to range. Several times he caught the thoughts of other Baldies. Through them he could have located Horne instantly and accurately, but they did not wear the Mute helmets, and their minds could have been read in turn by the paranoid. And Horne must not be forewarned. Cody reached up to touch the fine-spun skein of filaments hidden beneath his wig. As long as he wore the Mute helmet, Horne could not read his mind.

The crowds began to thicken. Rumors went softly flickering past like heat-lightning in the sweltering air, gathering corroborative detail as they

went. Someone—Cody's mind heard the whisper—had broken the bank at the Gold Horseshoe last night, walked out with two heavy sacks of credits, and carelessly let his wig blow off in the doorway, revealing a hairless head. Yes, the Baldies were casting off the mask now and grabbing up credits in every way they could, preparing for the zero hour when they would take over the nation.

Cody walked a little faster. Stray thoughts from the Baldies in American Gun whispered to him. *Things are getting out of hand*, the word went silently through the air from mind to mind, from anxious group to group, from Baldies going stoically about their business among the humans and showing impassive faces as their minds touched and clung together on the verge of panic. Today mothers had kept their children home, and the family copters were fueled and ready.

Above the crowd, Cody saw the flashing sign of the Last Chance ahead. He moved on, his mind searching for the presence of Horne. And, in spite of the noiseless tensions straining and wrenching through the hot air, he realized that he felt curiously happy. Everything seemed very easy and simple now, for the first time in many months. *Kill Horne*. That was all; that was enough. *Kill Horne*, his mind said, without any of the doubts and unsurenesses of the last months and years.

He paused outside the old-fashioned photoelectric doors of the Last Chance, searching for his enemy. The rumors blew past him, fresh as if no voice had ever whispered them before. The whispers spoke of the string of freight-copters grounded with a fuel-leak at the edge of town, the repair man working among the cargo who accidentally broke a slat on a crate of oranges. Inside the liner of oranges were queer-looking rifles—atomic? Three Eggs

carefully packed in foam-rubber? Unconscious humans en route to a secret Baldy vivisection lab?

Then an invisible breath seemed to sweep through the hot, still air.

It was the paranoid aura. As, in petit mal, the epileptic attack is presaged by an indefinite feeling of impending disaster, so the physical approach of a paranoid carries before it the shadowy halo pushing outward from the distorted mind. Cody had felt this before, but each time he knew afresh the same faint shrinking, as though his contact with the bright, hot, green world around him had thinned and snapped for an instant.

He turned slowly and crossed the street, threading past the uneasy, murmuring groups of unshaved men, past their hostile stares. Ahead was a little restaurant—the Copter Vane Eatery. The aura thickened. Cody stopped outside the door of the restaurant and reached out telepathically.

The rumors flew past him. A man knew a man who had a Baldy neighbor who lost three fingers in a duel a month ago, and today had three fingers growing as good as new, grafted on in a private Baldy hospital. (But Baldies won't duel—never mind that!) They could work miracles in medicine now, but you didn't see them doing it for humans, did you? If they weren't stopped soon, who could tell what might happen next?

Stiff with arrogance, wary with suspicion, the mind of Jasper Horne, within the restaurant, sent out its own murky thoughts too—egotistical, prideful, sensitive, and inflexible. And there was a dim thought stirring in that cloudy mind, like an ember under gray ash, fading and brightening again into half-clarity, which made Cody, at the restaurant's door, pause and stiffen into immobility for fear that the telepathic paranoid might sense his presence.

Horne had not come to American Gun to start a pogrom.

His real motive was far more deadly.

It was—

What?

That was what Cody could not see—yet. He had glimpsed the shadow of a thought, and that glimpse had been enough to flash a sharp warning to his mind, a signal of terrible urgency. Horne's real motive lay deeply buried. But it had to be found out. Cody felt quite certain of that.

He stepped aside, leaned against the wall of the building, and glanced idly around, while from under the Mute helmet his mind probed very delicately and sensitively toward Horne.

Gently . . . gently.

The paranoid was sitting alone in a booth near the back of the restaurant. His thoughts were clouded with repression. And he was concentrating on his lunch, not consciously thinking of the thing which had drifted across the surface of his mind for a triumphant instant. Unless this concept was summoned into consciousness, Cody could not read it without deep probing, which Horne would immediately sense.

Yet there was a way. The right cues would summon up the appropriate responses in any mind. But those cues would have to be implanted in Horne's thoughts very delicately, so that they would seem perfectly natural, and his own. Cody looked across the street, beyond the murmuring knots of men, at the Last Chance. Horne had been there half an hour ago. It was a fair cue. He sent the concept *Last Chance* softly into Horne's mind.

And that mind flinched warily, searched, found nothing—the Mute helmet guarded Cody—and then the cue summoned up its responses.

Last Chance—gambling. But I'm the

one who's really gambling with them; all of them. Their lives. I can kill them. All, if in time—the thought-chain broke as videomusic swelled within the restaurant. Horne lifted his fork and began to eat again.

Cody fitted the beat of his thought to the music's beat and sent the message to Horne.

Kill them all. Kill them all. Kill them all.

Loose the virus, Horne's response came to the stimulus he thought was his own. Pomerance is getting closer. Every day control the resonance; mutate a virus. Kill them all. Kill them all. KILL THEM ALL!

Cody braced himself against the red rage that poured out from the paranoid.

Pomerance, he thought. Pomerance.

Pomerance in the labs, Horne thought, and formed a sensory image. Not far away—only two blocks away—were the research laboratories of American Gun, and in them was a man named Pomerance a biochemist, a nontelepath. He was working on a certain experiment which—if it succeeded would enable the paranoids to develop a virus as deadly and as specialized as the virus of Operation Apocalypse.

And this was the real reason for Horne's presence in American Gun. The pogrom-plan was a cover up. It was camouflage to deceive the Baldies, while Horne went about his real purpose of telepathically following Pomerance's experiments toward the goal of an Operation Apocalypse brought about by the paranoids themselves.

Pomerance was not aiming at such a goal, of course. He was a biochemist; his aim was to develop a more efficient bacteriophage—but the method he would need to develop that could also be applied to far deadlier aims.

Gently Cody manipulated the paranoid's mind. He learned a little more. Pomerance might fail—Horne realized that. But in that case, then the pogrom could be set off. It would be better to find and use a human-killing virus, for in a pogrom paranoid lives would be lost too—but there would be a pogrom if no better way offered. Conditions were ripe. Horne had built the tension in American Gun; he had located the potential mob-leaders; he could start the pogrom at any time he desired—and that would be the signal for other paranoids across the nation to do the same. That universal pogrom would force the Baldies to release Operation Apocalypse—so the same end would be achieved. But it would be better to wait a little, just a little, following Pomerance's experiments closely. He seemed to be very near his goal.

Too near, Cody thought, his body swaying a little toward the restaurant's door. He was wasting time. Kill Horne, kill him now, he told himself—but hesitated still, because there was something else in the paranoid's mind that puzzled him. Too much confidence was built on that twisted, shaky foundation of paranoid personality. There must be some reason for that surprising lack of anxiety.

Cody probed again with careful cues that brushed the other mind lightly. Yes, there was a reason. There was a bomb hidden in Pomerance's laboratory.

Why?

Horne had that information, and Cody gently extracted it. The biochemist must not be allowed to fall alive into the hands of Baldies. The bomb was triggered to explode whenever Horne summoned to consciousness a certain complex of symbols—the paranoid's mind shifted quickly away from that dangerous equation—and it would also explode if Horne's mind *stopped* thinking.

That is, if Horne died.

Like the pattern of a burglar alarm, an interruption in the flow of current, the radiations emitted constantly by Horne's mind, sleeping or waking, would break the circuit and set off the alarm—the bomb that would kill Pomerance. Cody saw the location of that bomb very clearly in Horne's mental image of the laboratory.

So, if he killed Horne, Pomerance would die, too. But why was this important to the paranoid?

Cody probed again, and suddenly understood the reason.

Pomerance's research was centered around resonance differential applied to the nucleoproteins that were viruses. But there were other types of nucleoproteins; the telepathic function itself depended on the resonance of nucleoproteins in the human brain. If Pomerance's experiment succeeded, it would mean—

It would mean that telepathy could be induced in a nontelepath!

It was the answer to the problem of the Inductor, the one answer that could solve the universal problem of a world in schism. In the hands of the paranoids, Pomerance's method could destroy all humans. In the hands of the Baldies, it could make all mankind one. It could—

Suddenly Cody knew that Horne had discovered his presence.

Instantly Horne began to build in his mind the equation that would set off the bomb in Pomerance's laboratory. Cody's mind leaped into the future. He could kill Horne before the paranoid had finished, but if he did that, the other's death would trigger the bomb with equal certainty. Pomerance would die—and that must not be allowed to happen. More than lives depended on the biochemist's survival.

There was no way to stop Horne's

thoughts except one. Cody's probing into the other's mind had told him a great deal about that proud, inflexible, unsure personality. He now knew more about Horne than the latter himself did. And he had discovered one vital point. Horne was not psychotic; he had not lost touch with reality, but, like many paranoids, he had psychopathological symptoms, and one of these was his strong tendency to what Allenby would have called hypnogogic hallucinations—vivid sensory images occurring in the drowsy state just before sleep. And such hallucinations can easily be produced by hypnosis.

All Cody had to do was to convince Horne that he had momentarily been hallucinated. That, and a little more—a good deal more.

At least, Cody had a good insight into what forms such imagery would take for the paranoid, with his strong delusions of persecution and grandeur. So Cody projected the idea that he, representing the Baldies, had come to Horne to offer a truce, to make a pact with the paranoids against the humans—exactly the kind of vivid wish-fulfilling fantasy Horne must often have experienced. And at the same time he summoned up the mental image of Jasper Horne and let Horne see it.

That action was natural enough, even within the frame of a hallucination. When you communicate with another, you visualize him in your own mind, in many more dimensions than the purely visual ones. Your impressions of his emotional patterns, his memories, his thoughts, the complex image of his whole personality as you perceive it, is summoned up as a subjective correlative of the objective man with whom you communicate. The burning brightness of that Luciferian image stood clear between the meeting minds, blazingly sharp

and vivid, in a way that the murky mind of the paranoid had never known.

The ancient Greeks knew what the mechanism of identification meant—they told the story of Narcissus. And the lure caught Jasper Horne, who could identify with no other man than himself, or a god made in his own image. His paranoid egotism reflected itself in that ego-image and was reflected again and so endlessly, while Cody delicately tested and touched the thoughts of the other and watched for the first slackening of consciousness.

At least Horne had paused in his mental building of the concept that would destroy Pomerance. The paranoid hesitated, unsure, his grasp of reality telling him that the Baldies could not, would not send an emissary to capitulate, and that therefore his senses, which had warned him of Cody's presence, had lied. Such panics were not unknown to Horne. So he could accept—tentatively—the suggestion that his senses had tricked him.

Very, very gently, still maintaining that dazzling ego-image of Jasper Horne like a glittering lure on a baited hook, Cody sent quiet cue-thoughts slipping into hesitant mind. At first they were obviously true thoughts, true, at least, according to the paranoid's system of belief. They were pleasant, reassuring thoughts. Lulled, Horne watched the ego-image which he himself had often summoned up—yet never before so clearly and dazzlingly. Narcissus watched his image in the clear, deep pool of Cody's mind.

So, sitting alone in the restaurant booth, Horne let his wariness relax little by little, and Cody's soft assault moved into a new area. The thoughts Cody sent out now were not quite true, but still not false enough to startle the paranoid, who took them

for his own thoughts. *I've had these hallucinations before. Usually just before going to sleep. I'm having them now. So I must be going to sleep. I am sleepy. My eyelids feel heavy—*

The lulling, monotonous thoughts began to submerge Horne's consciousness. Gradually the hypnosis grew. Narcissus watched Narcissus—

Sleep, sleep, Cody's mind whispered. You will not waken until I command you. Nothing else will awaken you. Sleep deeply—sleep.

The paranoid slept.

Cody began to run along the street as fast as he could. No other Baldy in American Gun was nearer to the research laboratory than he was, and if Pomerance were to be saved, it was his job alone. And he might easily fail. Jasper Horne was sitting in hypnotic sleep in a crowded restaurant, and at any moment someone might speak to him or shake him back into consciousness. The hypnosis was not deep. It might hold, or it might break at any moment. In spite of Cody's final suggestions to the paranoid, the latter could be awakened quite easily, and by anyone.

Cody ran on. Suppose he got Pomerance out of the lab in time? Could he get back to the restaurant again before Horne wakened?

No, Cody thought, the hypnosis isn't deep enough. It'll be a miracle if Horne stays under more than a few minutes. If I can save Pomerance, that will be miracle enough.

But as soon as Horne realizes what's happened, he won't wait. He'll start the pogrom. It's all ready, here in American Gun; he's planted the dynamite, and all he has to do is touch the detonator. All right. I can't be sure that what I'm doing is right. I think it is. I can't be sure. If I save Pomerance, Horne will probably start the pogrom before I can get back and kill him. But I can't let Pomerance die;

he can solve the problem of the Inductor.

Hurry!

He ran toward a group of long, low buildings. He knew the way; he had seen it in Horne's mind. He ran toward one of the buildings, thrust open the door, and was in the laboratory.

A gaunt, gray-haired man in a stained smock turned to stare at him. It was Pomerance; no telepath can ever be mistaken on a question of identity. It was Pomerance—and as Cody realized that, he also realized that two blocks away, in the Copter Vane Eatery, Jasper Horne had stirred, wakened, and reached out in sudden panic to touch Pomerance's mind.

Instantly Cody was racing down the length of the long laboratory. Beyond Pomerance were floor-length windows opening on hot sunlight, blue sky, and parched brown grass. If they could reach the windows—

It seemed to Cody that he crossed the room in no time at all. No time, and yet another kind of time seemed to draw out endlessly as, in the distant mind of the paranoid, he saw the triggering equation building up that would set off the bomb's mechanism. Now the equation was complete. Now time would stop in one bursting moment of death.

Yet there was time. Cody sent out a wordless call, a summons that rang like a great alarm bell in the minds of every Baldy in American Gun. At the same moment he reached Pomerance and used his own momentum to lift the other man bodily as he plunged toward the windows. Then the floor rose underfoot and the air rushed outward before the first soundless compression wave that moved in front of the explosion.

The window loomed before them, bright, high, patterned with small panes. Cody's shoulder struck, he felt wood and glass shatter without a

sound because of the great, white, bursting roar of the explosion, louder than any sound could be.

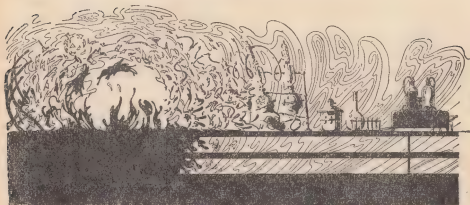
The blast exploded in a white blindness all around him and beyond shattering glass the void opened up under him.

He was falling with Pomerance through hot, dry outdoor air and darkness, darkness in the full heat of the sun, falling and turning while glass rained down around them and the noise of the explosion went on and on forever.

In front of the Copter Vane Eatery two transients scuffled. Jasper Horne, in the crowd, said something under his breath. Another man repeated it, louder. One of the transients flushed darkly. (It was a trigger-phrase as certain to rouse this man's aggressions as the equation that had exploded the bomb.) In a moment a dagger was pulled from its sheath, and a full-fledged duel was in progress in the middle of a noisy circle. The winner was a hairy-faced, hairy-chested man with a partially bald head. His knife-work had been very deft and sure. Too sure, Jasper Horne said in a loud whisper. The whispers flew around the circle. Anybody could win a duel if he could read the other man's mind. If *They* could grow fingers, maybe they could grow hair.

Jasper Horne said something, exactly the right something, to the potential mob-leader beside him.

The potential mob-leader scowled, swore, and took a step forward. Deftly he tripped the winner from behind as he was sheathing his dagger. The knife flew spinning across the pavement. Three men were on the falling bald-head as he went down. Two of them held him while the third tugged at his tonsure-fringe of hair. It held. The victim bellowed with rage and resisted



so strongly that four or five bystanders were sent sprawling. One of them lost his wig—

This was neither sleep nor waking. It was Limbo. He floated in the womb of non-self, the only real privacy a telepath can ever know, and what he wanted was to stay here forever and ever. But he was a telepath. He could not, even in the secret fastness of his own mind, pretend what was not true, for his mind lay quite open—at least to wearers of the Mute helmets like his own.

Yet it was hard to waken. It was hard to force himself, of his own volition, to stoop and pick up whatever burdens might be waiting for him, new and old. If his life could be lived as had been the last minute he remembered, without any indecision or unsureness, but with only the certain need for physical action (*is Pomerance alive*, something in his wakening mind asked), then it would be easy indeed to lift himself up out of this warm, gray silence which was so infinitely restful, without even dreams (*but Pomerance?*)

And as always, the thought of another made something in Cody brace and lift itself with weary stubbornness.

Instantly he was oriented. He did not need to depend on his own sleep-confused senses alone. All through the Caves, and above them, and in copters in midair, was a stirring and a confused sense of urgency and troubled motion, and each mind held one thought under whatever other thoughts might be preoccupying the upper levels of the mind.

The thought was *pogrom*.

Cody asked one question: *Should I have killed Horne instead of trying to save Pomerance?* But he did not wait for an answer. The decision had been his own, after all. He opened his eyes—knowing in what infirmary bed in what sector of the Caves he lay—and looked up at the round, ruddy face of Allenby.

"Pomerance?" he asked.

"Alive," the psychologist answered wordlessly. "Some of the American Gun Baldies got to you right after the explosion. They had to work fast. Horne had set off the pogrom. But they had a fast copter ready, and gave you and Pomerance first aid en route. That was two days ago."

"Two days?"

"Pomerance was unconscious for only a few hours. But we kept you



under till now—you needed it. However, I guess you'll live, in case you're wondering."

"How long will any of us live?" Cody's thought whispered.

"Get up and dress," Allenby ordered. "There's work to be done. Here's your clothes. How long? I don't know. The pogrom's been spreading for two days. The paranoids had everything very neatly planned. It looks like a total pogrom this time, Jeff. But we've got Pomerance. And I think we've got the Inductor."

"But Pomerance isn't one of us."

"He's with us, though. Not all humans are anti-Baldy. As soon as Pomerance understood the situation, he voluntarily offered to help in any way he could. So come along. We're ready to try the Inductor. I wanted you to be there. Can you manage?"

Cody nodded. He was stiff, and quite weak, and there were a good many aches and pains under the sprayed-on plastic bandages, but it felt fine to stand up and walk. He followed Allenby out into the corridor and along it. The troubled, urgent stirring of innumerable thoughts moved all around him. He remembered Lucy. *Not all humans are anti-Baldy.* And not all Baldies are antihuman, he

added, thinking of what had been done to the humans like Lucy who had been condemned to life imprisonment within the Caves.

"She'll be there—in the lab," Allenby told Cody. "She offered to be one of the subjects. We've got an Inductor jury-rigged according to Pomerance's theory—at least, we started with his theory and went on from there, every scientist among us. It was quite a job. I hope—" The thought of the pogrom shadowed Allenby's mind briefly and was repressed.

Cody thought: *I shall find time, Cassius, I shall find time—*

"Yes," the psychologist agreed. "Later, Jeff. Later. The Inductor is our goal right now. Nothing else. You haven't thought of Jasper Horne since you woke up, have you?"

Cody realized that he had scarcely done so. Now, as he did, he saw the paranoid leader as something remote and depersonalized, a moving figure in a great complex of action, but no longer the emotion-charged target of his hate.

"I guess I don't feel the need to kill him," Cody agreed. "He's not really important any more. The worst he could do was start the pogrom, and he's done that. I'd kill him if I had

the chance, but for a different reason—now." He glanced sidewise at Allenby. "Will the Inductor work?" he asked.

"That's what we're going to find out. But it ought to . . . it ought to," Allenby said, opening a door in the wall of the corridor. Cody followed the psychologist into one of the caverns which had been made into an experimental laboratory.

There was a great deal going on in the cave, but Cody was not distracted by external sense-impressions; he turned immediately toward where Lucy was standing, the baby in her arms. He went toward her quickly. He reached out to her mind and then checked himself. There was, perhaps, too much he did not want to know, now or ever, he decided.

Cody said. "These bandages don't mean anything. I feel fine."

"They told me," Lucy said. "It was one time I was glad of telepathy. I knew they could really tell if you were all right—even if you were unconscious."

He put his arm around her, looking down at the sleeping baby.

Lucy said, "I couldn't tell a thing by watching you. You might have been—dead. But it was so good to have Allenby and the others able to look into your mind and make sure you were all right. I wanted to do something to help, but there wasn't anything I *could* do. Except . . . this. Allenby told me he needed volunteers for the Inductor experiment. So I volunteered. It's one way I *can* help—and I want to."

So Lucy knew about the Inductor now. Well, the time and need for secrecy was past. It no longer mattered how much or how little the prisoners in the Caves knew. It no longer mattered, now that the pogrom had begun.

"It's a total pogrom this time, isn't it?" she asked, and he had an irrational second of amazement (*telepathy?*) before he realized that Lucy was merely reacting to cues learned through long familiarity with his behavior. All married couples have flashes of this kind of pseudo-telepathy, if there is real sympathy between them. And in spite of everything, that sympathy had existed. It was strange to know this now, to be sure of it and to feel elation, when so little time might remain. The pogrom could still destroy everything, in spite of the Inductor.

"Lucy," he said. "If we fail . . . we'll make sure you get safely out of the Caves, back home—"

She looked down at the baby, and then turned away from Cody. He suddenly realized, as men have always done, that even with telepathic power to aid him, he would never really understand a woman's reactions—not even Lucy's.

"Aren't you ready yet?" she asked Allenby.

"I think so," he said. "Let somebody hold the baby, Lucy."

She turned back to Cody, smiled at him, and put the baby in his arms. Then she followed Allenby toward an insulated chair, jury-rigged with a tangle of wires which led to a complicated instrument panel.

The mind of the baby had a little flame in it like the flames Cody remembered in the goldfish in the pool back at American Gun. But there was a very great difference. He did not know exactly what it was, but he had not felt pity and fear as he watched the glimmering minds of the fish. The mind of his child, his and Lucy's, held a small flame that burned with ridiculous confidence for so small and helpless a creature, and yet each slight stimulus, the rocking movement of his arms, the slight hunger-contractions

of the child's stomach, made the fragile flame quiver and blow in a new direction before it swung back to its perseverant burning. So many things would shake that flame, in even the best of all worlds—but, he thought with sudden clarity, in that flame the personality of the child would be forged and made strong.

He looked toward Lucy. She was sitting in the chair now, and electrodes were being attached to her temples and the base of her skull. A man he recognized as Pomerance, gaunt and gray-haired, was hovering over her, getting in the way of the experimenters. In Pomerance's mind, Cody saw, was a slight irritation the man was trying hard to repress. *This application, this connection—I don't understand how it fits the theory. If only I were a telepath! But if the Inductor works, I can be. Now how does this hookup fit into—and then the thoughts swung into inductive abstractions as the biochemist tried to puzzle the problem out.*

The cave-laboratory was crowded. There were the Mute-scientists, and there were a score of captives from the Caves—all volunteers, Cody realized warmly. In spite of everything, they had wanted to help, as Lucy had wanted to.

Now the test was beginning. Lucy relaxed in the chair, her thoughts nervously considering the pressure of the electrodes. Cody withdrew his mind. He felt nervous, too. He scanned the group, found a receptive mind, and recognized Allenby.

"Suppose the Inductor works," Cody said in silence. "How will that stop the pogrom?"

"We'll offer telepathy to everybody," Allenby told him. "There's a video hookup all ready to cut in on every screen in every town. I think even a lynch mob will stop to listen if they're offered telepathy."

"I wonder."

"Besides, there are plenty of humans on our side, like Pomerance. We've got—" The thought paused.

For something was happening to Lucy's mind. It was like a wave, a flood of something as indefinable as abstract music rising in Lucy's thoughts as the nucleoproteins of her brain altered. *She's becoming a telepath, one of us*, Cody thought.

"Power off," Allenby said suddenly. He bent forward and removed the electrodes. "Wait a minute now, Lucy." He stopped talking, but his mind spoke urgently in silence.

Move your right hand, Lucy. Move your right hand.

Not a Baldy looked at Lucy's hands. There must be no unconscious signals.

Lucy did not move. Her mind, opened to Cody, suddenly and appallingly reminded him of Jasper Horne's walled mind. He did not know why, but a little thrill of fear touched him.

Move your right hand.

No response.

Try another command, someone suggested. Lucy—stand up. Stand up.

She did not move.

It may take time, a Baldy suggested desperately. She may need time to learn—

Maybe, Allenby thought. But we'd better try another subject.

"All right, Lucy," Cody said. "Come over here with me. We're going to try someone else."

"Didn't it work?" she asked. She went to him, staring into his eyes as though trying to force rapport between mind and mind.

"We can't tell yet," he said. "Watch June."

June Barton was in the chair now, flinching a little as the electrodes were attached.

In Cody's thoughts something

moved uneasily—something he had not thought of since he woke. If the Inductor failed, then—it would be his problem again, the same old problem, which he had failed to solve. The dilemma which had sent him out to try to kill Jasper Horne. The responsibility that was too great for any man to carry after a while. Operation Apocalypse. *The end of all flesh—*

Very quickly he turned his mind from that thought. He reached out mentally with a sense of panic, while his arm tightened about Lucy. (*Would he have to kill her—her and their child? It may not come to that. Don't think about it!*) He searched for a concept intricate enough to drive the obsessive terror from his mind. *The Inductor*, he asked at random. *What's the theory? How does it work?*

Another mind leaped gratefully toward the question. It was Kunashi, the physicist. From beneath Kunashi's Mute helmet came quick clear thoughts that could not quite conceal the anxiety in the man's mind. For Kunashi, too, was married to a nontelepath.

"You remember when we asked the calculator for a solution to our problem?" (The electrodes were being unclamped from June Barton's head now.) "We gathered all the data we could to feed into the calculator. We read the minds of human scientists everywhere, and coded all the data that could possibly be relevant. Well, some of that data came from Pomerance's mind, more than a year ago. He wasn't very far along with his theory then, but the key concepts had been formulated—the hypothesis involving mutation of nucleoproteins by resonance. The calculator integrated that with other data and came up with the simplest answer—the virus. It didn't have the necessary data to follow the theory along the lines of the Inductor, even though both

concepts depend on the same basic—resonance."

(Someone else was sitting down in the chair. The electrodes were being attached. Cody felt the growing distress and anxiety in every mind.)

Kunashi went on doggedly, "Pomerance is a biochemist. He was working on a virus—Japanese encephalitis type A—and trying to mutate it into a specialized bacteriophage." The thought faltered for an instant and picked up again. "The reproduction of a virus—or a gene—depends on high internal resonance; it's a nucleoprotein. Theoretically, anything can change into anything else, eventually. But the physical probability of such a change depends on the relative resonance measures of the two states—high for the aminoacid-protein chain, for example, and the two states of the benzene ring."

(Kunashi's wife was sitting down in the chair.)

"The change, the reproduction, also involves high specificity of the chemical substances involved. That's the reason telepaths would be immune to the Operation Apocalypse virus, whatever it is. Now . . . now specificity can vary not only from species to species, but within the species, too. Our immunity is innate. The (*will it work? will it work?*) nucleoprotein of the Operation Apocalypse virus must have a high affinity for certain high-resonance particles in the central nervous system of nontelepaths. Such particles have a great capacity for storing information. So our virus would attack the information centers of the nontelepathic brain.

"That affinity depends on resonance differential—and Pomerance's experiments were aimed at finding a way to alter that differential. Such a method would make it possible to mutate virus-strains with great predictability and control. And it can also be used to

induce telepathy. Telepathy depends on high resonance of nucleo-proteins in the brain's information centers, and by artificially increasing specificity, the telepathic function can be induced in . . . in—"

The thought stopped. Kunashi's wife was leaving the experimental chair, and the physicist's mind clouded with doubt, misery, and hopelessness. Cody's thoughts linked with Kunashi's, sending a strong message of wordless warm encouragement—not intellectual hope, he did not have much of that himself—but a deep emotional bridge of understanding and sympathy. It seemed to help a little. It helped Cody, too. He watched Kunashi's wife walk quickly to him, and they linked arms and stood together waiting.

Suddenly Lucy said, "I want to try again."

"Do you feel—" Cody began, but immediately knew that there had been no change. Her mind was still walled.

Yet Allenby, across the room, nodded.

"It's worth trying," he said. "Let's do it with the power on, this time. The resonance effect should last for several minutes after disconnecting the electrodes, but we won't take any chances." Cody had taken the baby again, and Lucy was settling herself in the chair. "Ideally, all these gadgets will be in a small power-pack that will be worn and operating continuously—All right, Lucy? Power on."

Again mind after mind tried to touch Lucy's. Again Cody sensed, as he had sensed in the minds of the other subjects too, that strange walled aspect that reminded him of Jasper Horne. But Lucy wasn't paranoid!

Yet her mind did not open. So it was failure—not a mechanical failure for Pomerance's hypothesis had been verified by everything except the

ultimate verification of experimental proof. And yet, without that proof, the pogrom would rage on unchecked, spreading and destroying.

She's not paranoid! Cody thought. The baby stirred in his arms. He reached into that warm, shapeless mind and sensed nothing there that reminded him at all of Jasper Horne.

The baby, Allenby thought suddenly. *Try the baby.*

Questions thrust toward the psychologist. But they were not answered. He did not know the answers. He had a hunch, that was all.

Try the baby.

Allenby turned off the power and removed the electrodes from Lucy's head. The baby was laid gently, in his blankets, on the seat Lucy vacated. The electrodes were attached carefully. The baby slept.

Power on, Allenby ordered.

His thoughts reached out toward the child.

The child slept on.

Defeat, the last defeat of all, Cody knew. Telepaths and nontelepaths were ultimately different, after all. That wall could never go down. No armistice could ever be made. The pogrom could not be stopped.

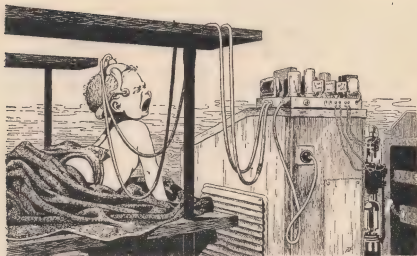
The paranoids had been right. Telepaths could not exist side by side with nontelepaths.

And suddenly in Cody's mind blazed the flash and roar of the exploding bomb, the blinding thunderclap that was to engulf the whole world now—

On the chair, the baby squirmed, opened its eyes and mouth, and screamed.

In the soft, floating mistiness of its mind was the formless shape of fear—the sudden flash and roar and Cody's own memory of falling helplessly through space—the oldest fear of all, the only fears which are inborn.

For the first time in history, telepathy had been induced.



Cody sat alone at the control panel of the electronic calculator. For there was no time at all now. In a moment the emergency telecast would begin, the last appeal to the group of non-telepaths. They would be offered the Inductor—conditionally. For they could not use it. Only their children could.

If they were willing to accept the Inductor and halt the pogrom, the Baldies would know very quickly. The most secret thoughts of men cannot be hidden from telepaths.

But if they would not accept—the Baldies would know that, too, and then Cody would touch a certain button on the panel before him. Operation Apocalypse would begin. In six hours the virus would be ready. In a week or two, ninety per cent of the world's population would be dead or dying. The pogrom might go on until the last, but telepaths could hide efficiently, and they would not have to remain hidden long. The decision was man's.

Cody felt Allenby come in behind him.

"What's your guess?" he asked.

"I don't know. It depends on egotism—paranoia in a way. Maybe man has learned to be a social animal; maybe he hasn't. We'll soon find out."

"Yes. Soon. It's the end now, the end of what started with the Blowup."

"No," Allenby said, "it started a long time before that. It started when men first began to live in groups and the groups kept expanding. But before there was any final unification, the Blowup came along. So we had decentralization, and that was the wrong answer. It was ultimate disunity and control by fear. It built up the walls between man and man higher than ever. Aggression is punished very severely now—and in a suspicious, worried, decentralized world there's a tremendous lot of aggression trying to explode. But the conscience represses it—the criminal conscience of a fear-ruled society, built up in every person from childhood. That's why no nontelepathic adult today can let himself receive thoughts—why Lucy and the others couldn't."

"She'll . . . never be able to?"

"Never," Allenby said quietly. "It's

functional hysteric deafness—telepathic deafness. Nontelepaths don't know what other people are thinking—but they believe they know. And they're afraid of it. They project their own repressed aggressions on to others; unconsciously, they feel that every other being is a potential enemy—and so they don't dare become telepaths. They may want to consciously, but unconsciously there's too much fear."

"Yet the children—"

"If they're young enough, they can become telepaths, like your baby, Jeff. His superego hasn't formed yet. He can learn, and learn realistically, with all minds open to him, with no walls locking him in as he grows and learns."

Cody remembered something an old poet had written. *Something there is that doesn't love a wall*. Too many walls had been built, for too long, walls that kept each man apart from his neighbor. In infancy, perhaps in early childhood, anyone was capable of receiving telepathic thoughts, given the Inductor. In infancy the mind of the child was whole and healthy and complete, able to learn telepathic as well as verbal communication. But soon, fatally soon, as the child grew and learned, the walls were built.

Then man climbed his wall and sat on it like Humpty Dumpty—and somehow, somewhere, in the long process of maturing and learning, the mind was forever spoiled. It was the fall, not only of Humpty Dumpty, but the immemorial fall of man himself. And then—

All the king's horses and all the king's men couldn't put Humpty Dumpty together again.

For Lucy, it was forever too late.

After a little while, Cody said, "What about the paranoids? They

were telepathic as children. What happened to them?"

Allenby shook his head.

"I don't know the answer to that one, Jeff. It may be a hereditary malfunction. But they don't matter now; they're a minority among telepaths—a very small minority. They've been dangerous only because we were a minority among nontelepaths, and vulnerable to scapegoating. We won't be, if—"

"What about the secret wavebands?"

"The Inductor can be built to adapt to any wave length the human brain can transmit. There won't be any more walls at all."

"If our offer is accepted. If it isn't . . . if the pogrom goes on—then I still have the responsibility for Operation Apocalypse."

"Is it your responsibility?" Allenby asked. "Is it ours, even? The nontelepaths will be making their own choice."

"The telecast's starting," Cody said. "I wonder how many will listen to it."

The mob that swept through the town of Easterday, secretly led by a paranoid, swirled toward a big house with a wide verandah. The mob sent up a yell at sight of the row of men standing on the verandah waiting. But the paranoid hesitated.

The man beside him did not. He shouted and sprinted forward. There was a sharp crack and dust spurted at his feet.

"They've got guns!" somebody yelled.

"Get 'em!"

"Lynch 'em!"

The mob surged forward. Again a rifle snapped.

The mob leader—not the paranoid, but the apparent leader—swore and dropped to the ground, clutching at his leg.

On the verandah a man stepped forward.

"Get out of here," he said crisply.

"Get going—fast."

The leader stared in amazement.

"Doc!" he said. "But you're not a Baldy. What are you doing?"

The doctor swung his rifle slowly back and forth.

"A lot of us up here aren't Baldies," he said, glancing along the row of silent men. Several races were represented, but the mob was not concerned with race just now. The lynchers searched out the men on the porch whom they knew to be Baldies—and found each one flanked by coldly determined nontelepaths, armed and waiting.

There weren't many of them, though—the defenders.

That occurred to the leader. He stood up, testing the flesh wound in his calf. He glanced over his shoulder.

"We can take 'em," he shouted. "It's ten to one. Let's go get all of 'em!"

He led the wave.

He died first. On the verandah a runty man with spectacles and a scrubby mustache shivered and lowered his gun for a moment. But he did not move from where he stood in the determined line.

The mob drew back.

There was a long pause.

"How long do you think you can hold us off, Doc?" someone called.

The dead man lay on the open ground between the two groups.

The air quivered with heat. The sun moved imperceptibly westward. The mob coalesced tighter, a compact, murderous mass waiting in the sunlight.

Then a telecast screen within the house lit up, and Allenby's voice began to speak to the world.

The telecast was over.

Baldy minds were busy searching, questioning, seeking their answer in minds that could not conceal their true desires. This was a poll that could not be inaccurate. And within minutes the poll would be finished. The answer would be given. On that answer would depend the lives of all who were not telepaths.

Jeff Cody sat alone before the electronic calculator, waiting for the answer.

There could be only one answer a sane man, a sane people, could give. For the Inductor meant, for the first time in human history, a unity based on reality. It opened the gates to the true and greatest adventures, the odyssey into the mysteries of science and art and philosophy. It sounded the trumpet for the last and greatest war against the Ilium of nature itself.

No adult living today could live to see more than the beginning of that vast adventure. But the children would see it.

There could be only one answer a sane people could give. A sane people.

Cody looked at the keyboard before him.

The earth is filled with violence through them.

Yes, there could be another answer. And if that answer were given—the end of all flesh is come before me.

I will destroy them with the earth!

Cody's mind leaped ahead. He saw his finger pressing the button on the keyboard, saw Operation Apocalypse flooding like a new deluge across the planet, saw the race of man go down and die beneath that destroying tide, till only telepaths were left alive in all the world, perhaps in all the universe.

He remembered the terrible, lonely pang Baldies feel when a Baldy dies.

And he knew that no telepath would be able to close his mind against that apocalyptic murder of all mankind.

There would be the wound which could not heal, which could never heal among a telepathic race whose memories would go on and on, unweakened by transmission down through the generations. A hundred million years might pass, and even then the ancient wound would burn as on the day it had been made.

Operation Apocalypse would destroy the Baldies, too. For they would feel that enormous death, feel it with the fatal sensitivity of the telepath, and though physically they might live on, the pain and the guilt would be passed on from generation to crippled generation.

Suddenly Cody moved.

His finger pushed a button. Instantly the guarding monitor began to operate. There was a soft humming that lasted less than a second. Then a light burned bright on the control panel, and under it was a number.

Cody pressed another button. The unerring selectors searched the calculator for the bit of crystal that held the code of Operation Apocalypse. The crystal, with its cipher of frozen dots of energy, was ready.

A thousand minds, sensing Cody's thought, reached toward him, touched him, spoke to him.

He paused for an instant while he learned that man had not yet made his decision.

The voices in his mind became a tumultuous clamor. But the ultimate decision was neither man's nor theirs; the responsibility was his own, and he waited no longer.

He moved his hand quickly forward and felt the cool, smooth plastic of a lever sink with absolute finality beneath his fingers.

On the bit of ferroelectric crystal waiting in the calculator, the cipher-pattern of energy shivered, faded, and vanished completely.

Operation Apocalypse was gone.

Still Cody's fingers moved. Memory after memory died within the great machine. Its vast pools of data drained their energy back into the boundless sea of the universe and were lost. Then at last the brain of the calculator was empty. There was no way to recreate the Apocalypse—no way and no time.

Only waiting was left.

He opened his mind. All around him, stretching across the earth, the linked thoughts of the Baldies made a vast, intricate webwork, perhaps the last and mightiest structure man would ever build. They drew him into their midst and made him one with them. There were no barriers at all. They did not judge. They understood, all of them, and he was part of them all in a warm, ultimate unity that was source of enough strength and courage to face whatever decision mankind might take. This might be the last time man would ever bind itself together in this way. The pogrom might go on until the last Baldy died. But until then, no Baldy would live or die alone.

So they waited, together, for the answer that man must give.



DESTRUCTION FROM ATOMIC WEAPONS

By LT. THEODORE S. SIMPSON, USAF

Speculation on "What would happen if . . ." usually makes more sense if some data is available. Here's some decidedly needed data for speculation!

THE atomic bomb is in the back of, or should be in the back of the mind of every citizen as a very possible and potential weapon to be used against our cities in future warfare. To plan for personal and personnel defense against such weapons, we must have thorough knowledge of their effects.

The atomic bomb described in this article will be the so-called nominal bomb, comparable to those used on Japan, having a power equivalent of twenty thousand tons of TNT. Actually, this equals 2×10^{13} calories of energy from the fissioning of 3×10^{24} atoms of uranium. As you probably know, this tremendous explosion rests on one basic reaction—the splitting of uranium 235, one of the lighter isotopes of the heavy element, uranium, as the result of its capture of a neutron. The energy released by a single fission of a U-235 atom is around two hundred million electron volts. The formula for this reaction is $N + 92 \text{ }^{235}\text{U} \rightarrow 92 \text{ }^{236}\text{U} \rightarrow \text{FP1} + \text{FP2} + 2\text{N} + \gamma + \text{E}$. The most important product of the reaction is the free neutrons (2N) which collide with the other atoms of U²³⁵ causing the chain reaction. The fission products (FP1 + FP2) which are radioactive give off

radiation (Alpha α , Beta β , and Gamma γ) until they decay into stable forms.

The main factor in the destruction caused by the fission process is kinetic energy which composes some eighty-three per cent of the total energy. The fission neutrons give three per cent, instantaneous gamma five per cent, and the energy of the gamma and beta from the fission products is eleven per cent.

The casualties in Japan from the air burst—20KT at two thousand feet—were caused greatly by the blast of the bomb. Blast caused sixty per cent of the casualties, thermal radiation twenty-five per cent, while nuclear radiation caused only fifteen per cent. One of the main reasons for the great number of casualties at Hiroshima, was the time of day the bomb was dropped. Early on an August morning in 1945, a lone B-29 caused the air raid alert to be sounded as people were hurrying to their jobs about the city. Many scurrying to their jobs stepped into the greatest man-made blast to date. Outward from the center of blast—Ground Zero—one thousand feet, ninety-three per cent of all personnel were killed. In the average from three thousand feet to five

thousand feet, over fifty per cent of the personnel were killed. No other weapon in history has ever wielded such a blow.

At the instant of detonation, the temperature jumps from normal to 10^{10} centigrade. ($1,000,000^{\circ}\text{C}$). This extreme temperature causes complete bomb vaporization. Steel, cadmium, copper, et cetera, turn into gas as well as the remaining uranium and fission products. In comparison with this tremendous heat, the modern high explosive bomb raises to only $5,000^{\circ}\text{C}$.

At the same instant— 10^{-7} sec. [$.0000001$ sec.]—pressures develop at the core of over one hundred thousand atmospheres which force the surrounding media away, forming what is known as the shock wave.

Energy at this point— 10^{-7} sec.—is emitted in a wide range of wave lengths by electromagnetic radiation. The air absorbs radiation and becomes incandescent forming a glowing fireball which increases in size as energy is radiated outward. As the size increases the temperature, pressure and luminosity decrease.

The fireball at 0.10 milliseconds— 10^{-4} sec.—has a radius of forty-five feet and an isothermal temperature of $300,000^{\circ}\text{C}$ with greatly reduced pressures. The shock front and the radiation front—surface of fireball—are coincident, moving outward together and the luminosity appears one hundred times as bright as the sun at 5.7 miles distance.

At fifteen milliseconds—0.015 sec.—the ball has increased in size to three hundred feet radius, but the surface temperature has cooled to some $5,000^{\circ}\text{C}$; however temperatures are much higher at the core. It is at this point the breakaway occurs, as the shock front moves ahead of the radiation front. As the fireball increases in size to a radius of four hundred fifty feet at 0.5 sec. a secondary maximum

isothermal temperature of $7,000^{\circ}\text{C}$ is reached.

The shock front at this period is several hundred feet ahead of the radiation front with an overpressure of 30 psi, moving as a wall of compressed air at approximately the speed of sound.

Of the two phases of the shock front, positive and negative, the positive phase is the most important. It is of short duration—approximately 1 sec.—but causes the most structural failures as the peak overpressures are attained. The negative phase, lasting two or three times as long, is unimportant as the underpressure causes little or no damage. During this negative phase, air is cooled and if near saturation or high specific humidity, condensation occurs with formation of a thin cloud, called the cloud-chamber effect, which follows the shock front.

Ten seconds after the blast the shock front is around eleven thousand feet from ground zero while the fireball has risen fifteen hundred feet. The luminosity has died and the ball is rising at a speed of 200 mph.

Peak pressures on the ground vary from 50 psi at ground zero to 3 psi at 1.5 miles. Structures not of earthquake design will be destroyed under 30 psi—1,100 feet. Ten psi—4,000 feet—will collapse average buildings and 3.5 psi will wreck average residences.

The ranges of damage as found in Japan over land were complete destruction for a radius of .5 miles from ground zero, where all buildings except those that were earthquake resistant collapsed; severe damage out to a mile from ground zero in which all buildings received major structural damage; moderate destruction out to $1\frac{1}{2}$ miles and light damage out to eight miles. Variables in the ranges are atmospheric conditions, terrain and other field objects.

At Bikini ships were sunk out to

three thousand feet from ground zero and moderate to light damage out to six thousand feet.

In the underwater test at Bikini the shock front through the air was approximately equal to a 4 KT high air burst with ranges of damage one half that of a 20 KT bomb. The shock front, moving through the water, causes most ship damage, sinking out to eighteen hundred feet, damaging heavily and sinking some out to twenty-seven hundred feet; while all submerged submarines were sunk at this distance, 500 psi overpressure was observed out to thirty-six hundred feet.

Variables to consider in comparing effects of any future underwater burst with results of the Bikini Baker Test, are the energy of the bomb, depth of the water, depth of the detonation and the slope of the bottom.

Thermal radiations, traveling at the speed of light, are the second largest cause of casualties from the bomb. Of the different forms received, infrared is the most important as it is the major cause of flashburns. It is emitted immediately after the break-away lasting from 0.3 seconds to three seconds after the detonation, which means that evasive action in the first second can reduce the amount received by one half of the total.

The flashburn, which is a profile burn, is the result of direct exposure to the heat of fission. At three quarters of a mile from ground zero bare skins will receive third-degree burns, yet, if covered by light clothing, will receive no burn at all. The heat will burn to second degree out to two miles and first degree out to two and one half miles.

The thermal phenomena observed in Japan gave a clear record of the intense heat. Telephone poles, steel wires, charred out to three quarters of a mile. Polished granite was rough-

ened which takes a temperature of over six hundred degrees centigrade. Tile roofs were burned out to four thousand feet and it takes a temperature of 1,800°C four seconds to accomplish this. The temperature at ground zero, Hiroshima was 3,000°C. Flame burns—from secondary blast effects—and flashburns accounted for three fourths of total casualties and one half of total deaths.

Ultraviolet effect is slight as amount received is small and it is all delivered in one hundredth of a second so it can be disregarded.

Effective ranges of thermal radiation from a surface or low-air burst over land are slightly less than the high-air burst due to shielding. There is no thermal effect from an underwater burst as the heat of fission is absorbed by the water.

The final effect of the bomb is the nuclear radiations. Though the least important they have received most of the attention. These radiations are classed as initial, released during first minute after burst, and residual, released after first minute of burst.

In the high-air burst, residual radiation is unimportant for the source, fission products and unfissioned bomb material, has gone up with the mushroom cloud to be dispersed harmlessly over a large area.

The initial radiation, which is the most important, comprises about ninety-nine per cent of the total received.

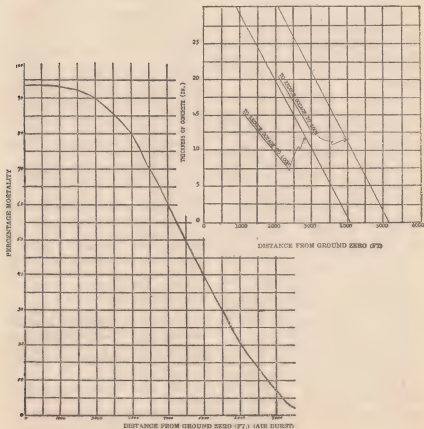
To further discuss these nuclear radiations it is necessary to classify and describe the three types of emanations coming from the fission process. They are the alpha α , Beta β particles and the gamma photon. The alpha particle, having a mass of four and a positive charge, is a helium nucleus that travels at a slow speed being stopped by a thin sheet of paper or skin.

The Beta particle, having approximately no mass and a negative charge, is a high-speed electron that can be stopped by a thin sheet of metal. Beta radiations in themselves can cause deep skin burns but in the air burst both the alpha and the beta particles have such a short range that they do not reach the earth.

The final and most destructive form of radiation are the gamma rays which in reality are hard or high frequency X-rays. They cannot be stopped but only attenuated by material and have a range up to two miles.

The prompt or instantaneous gamma, occurring in the first few millionths of a second is produced during the fission process. Along with the fission, neutrons are captured by a nucleus of unfissionable material casing, et cetera, and thereby becoming excited. As the nucleus returns to ground state, it emits one or more photons of gamma. This prompt gamma accounts for some three per cent of the total energy liberated by the bomb.

The delayed gamma, the most important form, comes from fission products emitting gamma in the pro-



cess of decay to stability; the greatest amount is liberated in the first minute as the rising fireball removes the source in air burst. Approximately one half of the delayed gamma is received in the first second. About three per cent of the total bomb energy is liberated in the first minute as delayed gamma.

The lethal dose—LD-100—is six hundred roentgens (R) and occurs out to four thousand feet from the burst. All personnel in the open would die.

The median lethal dose—LD-50—is around 400R and occurs out to four thousand two hundred fifty feet from the burst. About one half of the personnel in the open will die.

The median sickness dose—SD-50—in which half the people exposed will become casualties is about 200R occurring at five thousand feet. Probably all people receiving this dose will recover.

In a low or surface burst the initial radiations are slightly less than the high burst, but the residual radiations are quite important. Fission material, products and neutrons react with the soil causing a dangerous surface radiation. As an example, at Alamogordo where the bomb was detonated one hundred feet in the air, the dosage at ground zero one hour after blast was 8,000R. At six hundred fifty feet the dosage was 600R and it was not until one thousand feet was reached, that the dosage was down to 150R.

In the underwater burst the delayed gamma is the most important form of initial radiation as the decaying fission products are suspended and held in the base surge and plume.

The greatest hazard, however, from the underwater burst is the residual radiation coming from the fission products following out of the plume and base surge. Alpha and beta and gamma are all released during the fall-out. Alpha and beta are both internal

hazards and are dangerous if inhaled; swallowed or inoculated.

In the first thirty minutes after the burst it is estimated that fifty to ninety per cent of the total gamma dosage is received.

In the first six minutes after an underwater burst, it is estimated that all fall-out and rain-out have occurred and irradiation from fission products suspended in base surge is completed.

To discuss medical effects of radiation would take many lengthy though interesting articles; but here, briefly, are some of the clinical aspects of radiation as observed in Japan.

Epilation was observed among persons who had been close to the bomb and had survived at least two weeks. At fifteen hundred feet from ground zero, the incidence was seventy-five per cent and fell off sharply at thirty-eight hundred feet. The hair began falling out in bunches and reached a peak between the thirteenth and fifteenth day after the bombing. Even in severe cases, however, the hair fully returned in two to three months.

A severe dose of radiation caused nausea and vomiting as early as thirty minutes after the blast. Some thirty-two per cent of the individuals within the first three thousand feet and twenty-three per cent who were between thirty-four hundred and forty-five hundred feet suffered from vomiting on the day of the bombing. The incidence fell sharply to six per cent at six thousand feet.

The patients that died in the first two weeks complained of nausea and vomiting on the first day of the bombing. The following two weeks their temperatures rose till the last day as they experienced severe diarrhea, malaise, and thirst and died in delirium.

The dosages given before in this article mean irradiation of the entire

body. Doses up to thousands of roentgens may be given to small areas of the body without causing injury except to the desired area.

The effects of the bomb have been discussed in some detail as have the medical effects to a somewhat lesser degree. Now is posed the often asked question, "How many bombs will it take to contaminate the world?"

It can be assumed that a 20 KT bomb leaves one hundred pounds of plutonium and that the contamination is distributed uniformly over the surface of the earth which is approximately 5.1×10^{18} square centimeters.

The human hazard is from agricultural areas in which contamination is mixed with the top centimeter of soil. Concentration of plutonium in the ash of food is the same as in the soil. A man eats one thousand pounds of food per year of which one per cent is ash. Of the plutonium ingested, some 0.007 per cent is fixed in the body. The safe rate is 0.07 micrograms per year.

From these assumptions, we can calculate that from one bomb there is 2.5×10^{-6} micrograms of plutonium in one pound of soil. From a man's

yearly ration, he absorbs 1.8×10^{-10} micrograms of plutonium from each bomb exploded up to that time—hence, the number of bombs needed to endanger man is 0.07 divided by 1.8×10^{-10} or 4×10^8 —four hundred million bombs!

To have .1 roentgen of radiation in twenty-four hours over the entire earth—0.1 r/24 hr.—some six months after detonation, it takes no less than seven hundred fifty-five thousand bombs exploded at one instant.

The general effects of the several different types of bombs have been given. They can and have been used in setting up defensive measures against an atomic attack. However, every day brings new developments in atomic energy bringing life and death closer together. Nuclear science broadens man's understanding of the world about him, gives him new tools to help the living; and yet, it has unfortunately provided the atomic bomb and other potential weapons bringing an enormously increased capacity for human destruction.

It is up to man now to ask for divine guidance to lead us not to death, but to the stars.

ESTIMATED RADIATION DOSAGE OF AIRCRAFT AT 300 M.P.H. IN RADIO-ACTIVE CLOUD

<i>Altitude (feet)</i>	<i>Time after explosion (seconds)</i>	<i>Radius of cloud (feet)</i>	<i>Dosage (r)</i>	<i>Dosage rate (r per hr.)</i>
15,000	90	3,100	550	140,000
20,000	140	3,800	260	55,000
25,000	200	4,500	130	24,000
30,000	300	5,300	70	11,000
35,000	430	6,100	40	5,600
40,000	600	7,100	25	3,000

COMPARISON OF CASUALTIES FOR ATOMIC CONVENTIONAL BOMBS

	<i>Hiroshima</i>	<i>Nagasaki</i>	<i>Tokyo</i>	<i>Average of 93 attacks</i>
<i>Weapon</i>	<i>Atomic bomb</i>	<i>Atomic bomb</i>	<i>1,667 tons TNT and incendiary</i>	<i>1,129 tons TNT and incendiary</i>
Population per sq. mile.....	35,000	65,000	130,000	—
Square miles destroyed	4.7	1.8	15.8	1.8
Killed and missing	70,000	36,000	83,000	1,850
Injured	70,000	40,000	102,000	1,830
Mortality per sq. mi. destroyed	15,000	20,000	5,200	1,000
Casualties per sq. mi. destroyed	30,000	42,000	11,800	2,000

SUMMARY OF CLINICAL SYMPTOMS OF RADIATION SICKNESS

<i>Time after exposure</i>	<i>Lethal dose (600 r)</i>	<i>Median lethal dose (400 r)</i>	<i>Moderate dose (300—100 r)</i>
	Nausea and vomit- ing after 1-2 hours	Nausea and vomiting after 1-2 hours.	
First week	No definite symptoms. Diarrhoea Vomiting		
	Inflammation of mouth and throat.	No definite symptoms.	
Second week	Fever Rapid emaciation. Death (Mortality probably 100%)		No definite symptoms.
		Beginning epilation. Loss of appetite and general malaise.	
Third week		Fever Severe inflammation of mouth and throat.	Epilation Loss of appetite and general malaise. Sore throat Pallor Petechieae
Fourth week		Pallor Petechieae, Diarrhoea and nosebleeds.	Diarrhoea
			Moderate emaciation
		Rapid emaciation Death	(Recovery likely unless compli- cated by poor previous health or super-im- posed injuries or infections.)
		(Mortality probably 50%)	

VENUS OF TROY

By DANIEL WHITTON

There are limits to everything; enormously resistant as the electron-shells of atoms are, there comes a point at which even they yield to sheer, brute pressure. As a young planet grows, the pressure mounts—and there is a possibility of an explosion that makes an atomic bomb inconsequential!

LOOKING for a jim-dandy little way to blow up a planet? Sorry, we don't have anything really spectacular like total conversion of its mass to energy or collision with a contraterrene asteroid; but perhaps we have available for the chore energy equivalent to the simultaneous explosion of 10^{16} old-style plutonium bombs. This is the unexpected conclusion recently reached by Dr. W. H. Ramsey from his studies of the changes produced in matter by ultrahigh pressures, especially those to be found in planetary interiors.

Living as we do on the outside of our globe, we are subjected to the weight of a few miles of air; this pressure of slightly less than fifteen pounds per square inch is our standard, the atmosphere. If we are swimming under water at a depth of thirty feet, we have doubled the pressure by adding another 15 p.s.i.—pounds per square inch. Total pressures in the deepest parts of the ocean are about one thousand atmospheres caused, of course, by the crushing weight of the miles of water above. The pressures inside of the earth itself mount up even more rapidly as a function of depth, because of the greater density. For instance, it can be calculated that the pressures in the centre of our earth are about four million atmospheres.

We cannot, as yet, create such tremendous forces in the laboratory. Considering the nearly insuperable experimental difficulties, and the very real dangers involved, it is a tribute to the ingenuity of the high pressure scientists—not to be confused with salesmen of this variety!—that we know anything at all about the strange new properties of matter under these great stresses.

Workers at a number of laboratories have created pressures up to one hundred thousand atmospheres; and Professor P. W. Bridgman of Harvard, whose work in this field won him the Nobel Prize in physics, has recently achieved four hundred thousand atmospheres. As might be expected, pressures of these magnitudes produce remarkable changes in chemical and physical and even nuclear properties. When we compress gases under near-normal conditions, doubling the pressure halves the volume, because we are only squeezing out the space between the molecules; however, at a few thousand atmospheres this available "working space" has practically disappeared since our molecules are now as neighborly as they are in liquids or solids. For instance, air at only three thousand atmospheres remains a gas, but becomes as dense as "normal" water. Water itself under-

goes a whole series of transformations, giving seven different forms of ice, including one which under forty thousand atmospheres remains solid up to nearly 200° Centigrade. Each of these different forms is called a "phase," a term applied in physical chemistry to a homogeneous (uniform) sample of material in a nonhomogeneous (nonuniform) system. A common example is an ice cube in a glass of ice water. Here are represented the two phases of solid and liquid, and also the gaseous phase of the water vapor plus atmosphere.

When solid substances are compressed, the atomic lattice of the crystal may become unstable and collapse to a denser configuration, but there is an ultimate limit on the amount of interatomic space that may be squeezed out in this manner. As an example, let us look at elemental cesium, the most compressible of metals. It exists under normal conditions in a body-centered cubic lattice, but becomes transformed by twenty-five thousand atmospheres into a phase made up of the more compact face-centered cubic lattice. At forty-five thousand atmospheres, a much more interesting change takes place; a sudden twenty-one per cent change in density tells us, unmistakably, that at this pressure something must have finally given way—and in this case it was the atoms themselves which have shrunk. This is not, of course, a nuclear effect, but some sort of collapse in the size or arrangement of the electronic orbits. This is a reversible change; that is, the metal pops back to its original volume when the pressure is released. On the other hand, yellow phosphorus undergoes an irreversible lattice change at thirty-five thousand atmospheres to give the so-called "black phosphorus" which is quite inert chemically, looks like graphite, and is forty-eight per cent

denser than the starting material. It is important to note that most of these phase changes at higher pressures, either reversible or irreversible, produce a material which is more metallic in nature—significantly denser and a better conductor of heat and electricity. The metallic modification of arsenic, for example, is 2.8 times as dense as the nonmetallic yellow form. Tellurium moves out of the class of semiconductors—such as germanium which is used in the transistor—into the class of true metallic conductors, its electrical conductance increasing six-hundred-fold by the time thirty thousand atmospheres is reached. The observed increase agrees well with the values calculated by means of quantum mechanics.

The pressures thus far attained in the laboratory correspond to a penetration into the earth's crust of only four hundred miles at the most, yet, as we have already seen, new forms of matter are produced which markedly differ in their properties from the same material under surface conditions.* We can guess, therefore, that perhaps similar things may be taking place in the earth's interior.

It is well known from data obtained from reflected earthquake waves that our earth is built up of a number of shells surrounding an inner core. The outer shell, on which we live, is a rocky one some six hundred miles thick. Beneath this is an intermediate layer which extends downward another eleven hundred miles, and in the center is the core with a diameter of some forty-six hundred miles. In passing, it

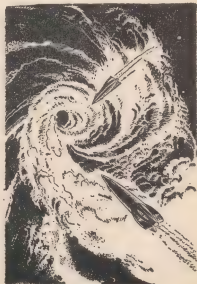
* It is interesting to note that most of the matter of the universe exists under conditions that we cannot duplicate in any terrestrial laboratory; the matter making up planets and stars is largely at too high a pressure and or temperature, and the matter existing between the worlds is suspended in a vacuum far better than our best pumps can attain.

may be noted that this inner core has about twice the diameter of the moon. The average density of the earth's outer crust is about 2.67; but the density of the core varies from 12.2 in the center to 10.1 at the transition level; the average density of the earth as a whole is about 5.52.

In the past, the existence of this dense inner core has been explained as being due to a separation and concentration of the densest materials, presumably at some time when the earth was in a liquid state. Dr. Ramsey thinks that this is not necessarily the case. If olivine, the principal constituent of the intermediate layer, were to collapse its molecular structure at a critical pressure of about one million four hundred thousand atmospheres to give a new phase with about twice the density, this would account for nearly all of the data which we have at present on the conditions near the center of the earth. As we have already seen, this is not an unwarranted assumption, since many other materials collapse at much lower pressures.

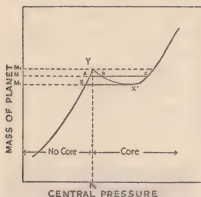
A few moments' thought at this point will show you that a certain critical mass is required before the central core is produced, since if an arbitrary Planet X is too small, the internal pressure never builds up to the necessary level to produce the denser phase. It should be noted, however, that the critical pressure would depend, not only on the total mass of the planet, but also on its internal temperature, since all known phase transitions are dependent on both factors. Mercury, Mars, and our moon are apparently in the lower range, existing without cores; each of the other major planets, it is believed, may support one. Dr. Ramsey and Dr. J. M. Lighthill have considered at some length a number of the predictable consequences of such a process

of core formation. Perhaps the most interesting situation of all is that of a planet which is just slightly smaller than the critical size. For simplicity in his calculations, he has used the pressure at the center of the body as the independent variable, with its mass as the dependent variable. The accompanying graph—taken from *Nature*, 168, p. 677 (1951)—shows the complex relationship which connects the two at a particular temperature. Point Y represents the critical pressure P_c produced by the critical mass M_c . From known values of density and pressures, et cetera, inside the earth, it may be calculated that point Y corresponds to a mass 0.80 times that of the earth, with a radius of about 3900 miles. To the left of Y, a smooth descending curve is obtained by straightforward and conventional calculations. The right hand portion of the curve shows the behavior of the mass-pressure relationship if we assume that the collapsed ore material



is over fifty per cent denser than the uncollapsed stuff.

Above M_1 , only one possible world can be formed, one without any core. Above M_0 , there is only one possible world, one which has a large core. However, at any mass M between M_0 and M_1 , there could be three different worlds: A , with no core, B , with a small core, and C , with a large one. The mass range between M_0 and M_1 in which a planet could have three possible configurations is about 0.02 the mass of the earth.



It is also possible to calculate the total energy of each of these three worlds, as well as the radius of each. It then becomes apparent that world B is in an energetically unstable position, and would therefore be expected to change into either world A , with no core and a larger radius, or world C , with a large core and a smaller radius. If some disturbance triggers off either transition from the unstable state B , the energies released could only be called astronomical; they would be of the order of 10^{36} to 10^{37} ergs, fully enough to remove completely from the surface of the planet nearly one per cent of its total mass. For comparison, let us consider the

energies released by other catastrophes. An atomic bomb releases about 10^{21} ergs; all the earthquakes in a year release about 10^{23} ergs; and the total energy output of the sun is 3.8×10^{33} ergs/second. This means that our simple phase transition would turn loose more energy than a million billion A-bombs, or all the earthquakes since the beginning of geological time, or the total energy output of our sun for half an hour.

This energy, which would be released in a very short period of time, would appear in different forms. If the planet were to collapse to form a larger core, the energy would appear as vibrations to the planet as a whole, ultimately appearing as heat sufficient to warm the entire mass by perhaps 100° C. or so. On the other hand, if the core were to disappear, the energy would appear as blast waves traveling outward to the surface, with pressure amplitudes up to hundreds of thousands of atmospheres, easily enough to completely shatter the surface and to cast whole continents adrift in outer space. In either case, the change in radius would be nearly sixty miles; the maximum motion in the worst earthquake ever recorded was only a few feet.

Dr. Ramsey suggests, "tentatively," that meteors and perhaps asteroids may have originated in the solar system in such a manner. We already know the physical conditions of pressure and temperature needed for the formation of the compounds found in meteors; thus it is reasonably well established that meteors were formed in an astronomical body of appreciable size, and are not just so much uncollected floor sweepings, as it were, that never became a planet. The irregular shapes and reflectivities of the asteroids also suggest some sort of catastrophic origin. Dr. K. E. Bullen wonders if our moon may not have

been torn from the earth in past millennia by such a planetary fission when a still denser inner core exploded.

Could such a violent fate befall our earth? Will we have to get up on our spaceships and gallop off in all directions to escape such a world-shattering and scattering blast? Well—it would seem not, since old Terra is a good twenty-five per cent above the calculated critical mass. However the critical mass, calculated to be about

0.80 the mass of the earth, is not too far removed from the mass of Venus, which is 0.817 that of Earth. In all of the pressure studies thus far made, the phase transitions are functions of both the total pressure and the temperature. A not unreasonable change in temperature, say by the gradual buildup of heat from radioactivity, or perhaps an increase in the output of neutrinos from the sun, could put Venus into the critical region.



IN TIMES TO COME

NEXT month Tom Godwin has the cover story "The Gulf Between." The cover is by a new artist—Kelly Freas. It is in a new style. I think Freas has done a remarkable job of putting over the concept behind Godwin's story.

Godwin's story discusses Man versus Robot from a quite new angle. That there is a gulf between is obvious, but what is the nature of that gulf? What's the inherent difference between the kind of thinking the robot does and the kind a living entity, even a dog, does?

It looks as though Godwin has presented an excellent case for his answer as well as a bang-up story!

Also coming up in the somewhat more distant future are a number of highly interesting items that I can't schedule definitely as yet.

The Chalk River Nuclear Pile had an accident—the first nuclear pile to go out of control. The problems that arise when radiation gets loose are considerable. Wallace West has an article coming up on how you clean up after someone has dropped a hot pile. It's not fun.

THE EDITOR.



"RARE" METAL

The following is the verbatim text of a release from the Atomic Energy Commission.

And you know, they used to have a group of metallic elements known as the "rare earth elements." Wonder what the latest quotation on praesodymium, in ton lots, is?

THE Atomic Energy Commission has entered into a contract with the Carborundum Metals Co., Incorporated, a subsidiary of the Carborundum Company of Niagara Falls, New York, for the production of zirconium and hafnium metal. A. Tammaro, Manager of the Chicago Operations Office, signed the contract for the AEC. It provides for the sale of approximately 150,000 pounds of zirconium and hafnium sponge metal each year for a period of five years at a unit price of less than \$15 per pound. The Carborundum Metals Company will design, build and operate its own production facilities.

The Commission's present requirements for zirconium and hafnium are being met by pilot plant production in government-owned facilities at Oak Ridge, Tennessee, where the raw material is purified, and Albany, Oregon, where purified zirconium oxide is converted into metal. The Carborundum contract represents a significant step in the Commission's program to encourage private enterprise, using private capital, to take over portions

of AEC work which can be handled on a conventional business basis.

Zirconium is a metal useful in the construction of nuclear reactors. Its desirable properties are its corrosion resistance, ductility, strength and low rate of absorptions of neutrons. It had not been produced on a large scale prior to the time the Government began pilot plant operations about two years ago.

The present process for production of zirconium sponge was developed and placed in pilot plant production by the Bureau of Mines at its Northwest Electro Developmental Laboratory at Albany, Oregon. The Bureau of Mines was encouraged in this work by the Navy's Bureau of Ships and by the AEC because of their long-range interests in zirconium. The mutual cooperation among these three Government agencies has contributed substantially to the success of the work in Oregon. Both zirconium and hafnium are produced from zircon sands presently obtained from the beaches of Florida.



THE GARDEN IN THE FOREST

By ROBERT F. YOUNG

We would have very little metal indeed if the miner could not recognize potential in dark, stained rocks. In judging a race, perhaps something of the same is important. . . .

Illustrated by van Dongen

FROM: Administrator of Alien Cultures
Stellar Headquarters
Sosterich III

TO: Ghan, Supreme Arbiter
Parapsychology Center
Sosterich IV

GENERAL: The Office of Perimeter Research reports that the culture in Star Group 206 has entered Phase Nine. *Phase Nine cultures have a fear base, are unstable, and are usually immune to regenerative stimulus.* (Ref.: THEORETICAL EVOLUTIONARY PATTERNS, Official Version; I. S. Library.)

SPECIFIC: It is the carefully considered decision of the Office of Perimeter Research that the culture in question constitutes a menace to Galactic Security. Therefore, the only logical recourse is immediate extirpation. However, since no culture beyond Phase Eight has ever been known to exist, such procedure will be unprecedented and will require the authorization of the Supreme Arbiter.

REQUEST: That the Supreme Arbiter personally check the culture in question and forward his report to this headquarters, with authorization appended if his decision coincides with the decision reached by the Office of Perimeter Research, or with recommendation as to alternate course of action if it does not.

Quadri-dimensional spatial warps involve neither subjective nor objective temporal distortion. Ghan's transition not only seemed instantaneous; it was instantaneous.

Since the type of investigation he intended to make usually obtained the most relevant results when conducted along unpremeditated lines, he had chosen his base at random. He was neither surprised nor chagrined, then, when he materialized in a snow covered field. If anything, he was mildly pleased to have struck a zone with a climate that was reminiscent of summer on Sosterich IV.

A small group of buildings showed against a blue backdrop of afternoon sky, and he set off across the fields toward them. The terrain presented little of interest: a few isolated stands

of timber, an eroded hill or two. Presently he came to a winding road and since it afforded a more comfortable base for ambulation he chose it in preference to the more direct route. He could have teleported of course, but on a mission of this sort it was better to be circumspect, at least until initial orientation had been completed.

The group of buildings resolved into a dominant red structure, a much smaller white structure, and several odd nondescript structures. Ghan identified them tentatively with their word equivalents, drawing from one of the languages he had assimilated just before his departure: a barn, a house, a coop or sty of some sort, a—

He had no word for the small skeletal structure in the immediate foreground. It was an elaborate framework of some kind and it was overrun with tangled thorny vines. It stood in an area of small oval hummocks and geometric pathways. It appealed to him instantly as a practical base for his operations. The fact that it would afford him no protection from the weather was immaterial.

He stepped inside and found a bench and a small table. He placed his portable transmitter on the table and he sat down on the bench. His headquarters was complete.

Before intensifying his 'pathic field he made a cursory probe of the adjacent buildings. All contained sentient life but the house contained the only type he was concerned with. He did not pause to examine it, however. It was more important, first, to ascertain whether he was centralized in an area that contained sufficient specimens to make a cross-section analysis valid.

He began intensifying.

The process was not enervating. A 'path of Ghan's ability could intensify for almost unlimited periods of time without harmful aftereffects. But in

order to attain the degree of concentration required, external physical awareness had to be sacrificed.

His field expanded in concentric waves. At first he touched sentient life only in scattered sequence, then in progressively heavier sequence, finally en masse. He focused.

A city. Complex, tiered, overcrowded. A plethoric jungle of thought patterns confronted him and he selected one at random for an experimental trans-probe.

In the Sosterich home system, and to a lesser degree in the scattered Sosterich satrapies, telepathy was a highly specialized art. It was thought-reading combined with analysis plus symbolical interpretation. The process was instantaneous. When Ghan probed a subject he participated in a dramatic representation of that subject's character.

His first subject was a man. The dominant symbol was a forest. It was a melancholic forest, overgrown, tangled, gloomy. The man was walking along a vaguely defined trail, pausing often to glance back over his shoulder. All he ever saw was an impassive arabesque of vines and foliage, yet he knew without doubt that he was being followed.

The trail led somewhere, but the man did not know where. The man hated the forest. He hated the scabrous trees with their hungry leaves that devoured the sunlight, leaving him only a pale pittance to illumine his way along the trail. He wanted to turn and retrace his steps, but he was afraid. He was sure that way back on the trail there had been a clearing, a clearing filled with warm sunlight. All he wanted was to find it again, but he knew he could never find it unless he went back. All he could do was to keep stumbling ahead, hoping that the trail did not follow a relentless straight line, hoping that it curved in a wide



circle back to the clearing, and if it did, if he found the warm safe place where the sun reached, he promised himself he would stay there forever—

Ghan disconnected. A moment ago he had been of the opinion that the Office of Perimeter Research had been precipitate in its judgment. It had been difficult to accept a Phase Nine culture as being anything more than theoretical.

It was difficult no longer.

Grimly, he sought another subject. But for some reason he had trouble concentrating. A discordant thought kept intruding, disturbing his focus. It was a strange wondering thought and it emanated from a source that was distant and yet close by. Annoyed, he decreased the intensity of his field to minimum. The thought came through clearly then: *Who are you?*

A small female of the species was standing just outside the entrance of his headquarters. Ghan became aware of two enormous blue eyes. For some time he was aware of nothing else. Eyes in Sosterich society were usually taken for granted; they were efficient organs that performed their intended function and that was all they were. They were of various colors, of course: often they were green, sometimes they were yellow, and once in a while they were brown.

But they were never blue.

Presently he saw that these eyes were part of a round white face framed with pale yellow hair. The thought came again and this time he saw the movement of the lips and heard the sound that accompanied it.

"Who are you?"

I am Ghan, he *pathed.*

"Ghan? What a funny name! But what are you doing in my mother's summerhouse?"

It was an unanticipated question

arising from an unanticipated situation. Ghan was angry with himself. He prided himself on his efficiency almost as much as he did on his objectivity, but for once he had forgotten something.

But "overlooked" would have been a kinder word. After all, he was investigating a Phase Nine culture, and the idea of a Ptsor Shield malfunctioning in a Phase Nine culture was on first thought fantastic.

But not on second thought. The Shield broadcast a constant series of negative waves; an endless repetition of the idea of *not being*. All that it needed in order to function was a geocentric culture, the individuals of which *wanted* to believe precisely what the Shield repeatedly told them: that the alien life form registered upon their retinas was not real.

Geocentrism was an integral part of a Phase Nine culture. However, geocentrism is a mature immaturity, and even in a Phase Nine culture there exist certain individuals who have not yet acquired that facility in the manipulation of transcendental logic that enables them to regard unpleasant phenomena and either replace them with pleasanter things or reject them altogether.

"You can't stay here, you know," the little girl standing at the entrance said.

Do you think your mother would mind?

"I think she might. I don't think she'd like you, anyway. Your clothes are so funny. And your hair! It's so long! And what makes it grow on the side of your head instead of on top?"

Ghan considered for a moment. While the small creature standing before him did not present a very serious obstacle to his investigation, she did create a problem just the same. If he wanted to carry on his

work with maximum efficiency, he would have to find some way to keep her from intruding upon his 'pathic field.

One way would be to tell her the truth. That could serve a double purpose: if she believed him, her curiosity would be satisfied, and if she repeated what he told her to an adult, her story would be instantly discredited.

"I am different from you in many ways," he said, speaking aloud for better effect. "I come from another star."

The little girl regarded him calmly with her blue, wide-open eyes. "Which star?" she asked.

"It is so far you cannot see it from this world—" He paused, watching her face, waiting for it to betray the surprise she must be experiencing. But her face remained serene and her eyes continued to regard him quietly out of the blue depths of her mind.

"But you can't really be so different," she said after a while. "Even if you do come from another star and even if you do have crazy hair and talk funny, you must be like other people inside."

"Not quite like them," Ghan said.

"I mean, you must have a heart, and there must be a place in your head where you think, and—"

"I do not have a heart. You see, we function differently on the world where I live. We—" His words trailed away. The little girl's eyes, which he had assumed were opened to their maximum circumference, had opened even wider.

"But you *must* have a heart."

"But I do not have. On my world—"

"*Everybody* has a heart."

"No—" He paused. The blue eyes had exhibited another unexpected phase. Mist obscured them now, and minuscule drops had begun coalescing in their corners. Then, for the first time in his life, Ghan was bewildered.

The little girl turned and ran away.

He watched until a corner of the barn hid her from view, and for a while he considered probing her. He decided against it. His original purpose had been merely to get rid of her. It did not matter whether that purpose had been accomplished by design or accident. What did matter was the fact that he was now free to continue his investigation without interruption.

And besides, idle curiosity was unbecoming in a Supreme Arbiter.

The snow around the summerhouse had taken on the bluish tinge of twilight. The temperature had dropped perceptibly, and Ghan was reminded of cool summer nights on Sosterich IV. For an unconventional moment he wished he were back there, reclining on the patio of his river villa, watching the frosty stars and fondling abstruse philosophies.

Nostalgia did not become a Supreme Arbiter any more than idle curiosity did. Annoyed with himself he discarded it and began intensifying his field. This time he dispensed with trans-probes. As soon as his focus was established, he teleported.

The chaotic canyon in which he materialized dismayed him at first, but he was a veteran of the mad milieus of many civilizations and he adjusted himself without trouble. He withdrew into a dark entrance, out of physical contact with the churning mass of humans and vehicles that filled the floor of the canyon, and prepared for his first probe.

A middle-aged man came down the street. There was a noticeable confidence in his walk, a corresponding confidence in his handsome, well-preserved face. As he passed the entrance, Ghan slipped into his mind.

The man was climbing a precipitous

mountain. He was sure-footed and agile and he found hand- and footholds in impossible places. He climbed higher and higher, staring resolutely at the sheer wall before him. Presently he paused to rest. He looked down then, and on the slope far below he saw another man. Uncontrollable hatred suffused him. He looked wildly about him for a weapon—a rock, a stone, even a stick—anything at all to hurl down on the man below him. But the face of the mountain was utterly bleak and offered him nothing.

Before resuming his climb the man glanced upwards. The mountain spired into the sky. The sun glittered coldly on its smooth polished surface. It had no ledges where a man could pause to rest; it was an endless obelisk, a perpendicular eternity.

The man began climbing again. Frantically desperately—

An old man with a decayed face shuffled past the entrance. Ghan probed again—

He was descending a rotting stairway into a noisome pit. (Total identification with the subject was possible after one or two probes.) There was a scurrying of furry creatures about his legs and a constant obscene squeaking. He didn't want to descend the stairway; the thought of what awaited him below filled him with unspeakable terror; and yet he continued to descend, down, down, ever downward, and there were cold slimy creatures intertwining about his legs now, and abruptly there was a cracking sound as one of the steps gave way, and he staggered and he almost fell into the loathsome Stygian depths—

A woman passed— After the stairway the warm spacious room seemed tranquil and secure. But not for long. Presently he noticed a twisted scar disfiguring one of the rose walls, and fleeing from the scar towards a vague

doorway he nearly stepped into a ragged crevice that yawned without warning in the blood-red rug. He managed somehow to avoid the crevice, but when he looked for the doorway again it was gone—

A young man walked briskly by— Another mountain, a gentle mountain this time. The lower slopes were green with grass and the forested upper slopes slanted leisurely into a blue and cloudless sky. It was morning and a summer sun warmed his back.

There were three women following him. Occasionally he paused in his ascent and glanced back at them. The first one had dark disheveled hair, and long graceful legs. But she had no face. The second one was half chimera, half reality. Most of the time she was a gray silhouette, but sometimes the silhouette resolved into a voluptuous body and a trite, pretty face.

The third one was a tenuous shadow—

It was dawn when Ghan returned to the summerhouse. He sat on the bench for a long time, staring through the interstices of the latticed roof at the sky. The sky was gray at first, but after a while the grayness softened subtly to pink, and then to a washed blue. Finally the first pale rays of the sun brimmed over a scalloped rim of hills and streamed across the fields.

He heard voices then, and caught vague thought patterns. Presently three figures came round the corner of the barn and approached the summerhouse. One of them was the little girl who had run away the preceding day. The other two were adults: a thin, pale woman, and a tall man carrying a double barreled shotgun.

"There, you see!" the little girl said, as they stopped before the doorway. "Now you've got to believe me!"

The man and the woman stared into the interior. They looked at the bench, the table, the transmitter (the transmitter was a tesseract, as invisible to three-dimensional beings as a cube would be to two-dimensional creatures). They looked at Ghan.

"Why, Alicia," the woman said, "there's no one here at all."

"But there is, Mother! Can't you see him? You're looking right at him! He's come all the way from a star and he doesn't have a heart and sometimes you can hardly hear him he talks so soft, and—"

"Alicia! That's enough. You're imagining all this."

"But I'm not!" The little girl was crying.

There was a puzzled expression on the woman's pinched face. Ghan slipped briefly into her mind—There was a forest, dark and tangled, and he was stumbling along an overgrown path. He did not know where the path led, but it had to take him out of the forest if he followed it long enough. The forest could not be forever. Somewhere in the forest there had been a clearing a long time ago—or was it a garden?—he could not remember. Once he had found it, he was sure, and now, more than anything in the world, he wanted to find it again. For he hated the forest, with its pale sickly foliage and its loathsome ophidian vines; he hated the forest by day, but he hated it more by night when you could not see, when you could not find paths, not even overgrown travesties of paths that led nowhere, and you had to crouch there in the misshapen shadows, in the abysmal darkness, in the lonely night—

The little girl was still crying, and the woman took her hand and led her away. The man stood by impassively, the gun slung under his arm. He had a thin, windburned face and watery

gray eyes. Ghan probed him as he stood there, not expecting to find, and not finding, any appreciable deviation from the general pattern his previous probes had established.

The symbol itself was a little more bleak, perhaps, than the others. Essentially, it was a featureless dreary plain. There were no mountains, there weren't even any hills. He was standing immobile in the midst of endless empty acres beneath an endless empty sky. There was a slight wind blowing; a cold wind. He had nebulous memories of another wind, a much warmer one; but that one had blown so long ago that he had forgotten how it had felt, and the cold wind wasn't so bad anyway, once you were used to it—

After a while the man turned and followed the woman and the little girl. The corner of the barn hid him from view and Ghan returned his attention to the sky.

It was such a magnificent sky that it was difficult to understand how anything ignoble could occur beneath it. The object of living—Ghan remembered the simple Sosterich credo—is to die gracefully. Under such a sky even the most uncultured savage should have been able to attain that ideal.

But not a semicultured savage. Not a Phase Nine barbarian.

Never a civilization honeycombed with fear. Never a race of people dominated by fear: fear-of-each-other, fear - of - themselves, fear - of - the - unfamiliar. For fear destroys compassion and nurtures hatred and misery. Fear is the accomplice of violence, the assassin of peace.

In a planetary sense, the danger of such a civilization was frightening; in a galactic sense, it was appalling.

There was little object in continuing the investigation. Ghan reached for

the transmitter. His tentacular fingers sought its minuscule activator.

There was little object, but still—

He had never seen a civilization destroyed. All civilizations previously analyzed had evinced at least one redeeming feature, presented at least one area of healthy tissue into which the curative philosophy could be injected.

He had never seen a civilization destroyed and he realized with sudden clarity that he never wanted to see one destroyed, and that above all he did not want to be instrumental in the destruction of this one.

Perhaps, somewhere, there was healthy tissue. Perhaps, if he looked long enough, he could find it.

His fingers fell away from the transmitter. He began expanding his field.

Another chaotic canyon. It was much like the other, though there seemed to be more confusion. But that was probably due to the time of day. He had difficulty finding a practical station but finally established himself in an unfrequented alleyway.

His first two subjects were mountain climbers. The fear motive in each case was typically predominant. His third subject represented a curiously recurrent pattern—the forest symbol, with the vague remembrance of a clearing that, in some cases, had the aspects of a garden and in others a grassy meadow.

The next three subjects were mountain climbers again. In despair, Ghan tried another section of the city.

And another—

Mountains and forests and dimly remembered gardens, and fear and hatred and bewilderment—

A tall man of noble mien passed Ghan's station—There was a great plain covered with monolithic statues. He was traveling across the plain, through the maze of statues, bowing before almost all of them, kissing the

stone feet of others. In the distance a great obelisk pointed into the sky, its peak half obscured by fleecy clouds. It was white and shining and beautiful.

Here at least, Ghan thought, was a possibility.

Presently the man realized that he was not alone on the plain. There was furtive movement all around him, and once he came upon another man paying homage. Quickly he slipped behind another statue, swiftly kissed its feet, then hurried in a wide detour, bowing and kneeling and kissing, around the other man. He breathed more easily when he was sure he was ahead, but when he looked at the obelisk again it was just as distant as before—just as remote.

Ghan's own mind had become an arctic steppe. For a moment the symbol had misled him, but only for a moment. The symbol was just another mountain; a two-dimensional mountain. The obstacle was not height, but ceremony; the goal was still dominance, but it was disguised as apotheosis.

And the motivating factor was the same. *Fear*.

He returned to the summerhouse.

It was afternoon and a slight wind was coming over the white fields. The sky was still clear and blue. He reached for the transmitter and his fingers again sought the tiny activator. And then he paused.

Beside the transmitter there was a folded sheet of tablet paper weighted down with a stone. Wonderingly, he picked it up. On its outer surface, laboriously printed, were the words, "Mr. Gan."

He unfolded the paper.

Around its border a series of curious designs had been painstakingly penciled. At first glance they appeared to

be little more than misshapen circles, indented at the top and elongated at the bottom. But each was crayoned an intense red and each was labeled—so that there could be no room for doubt—with the word, “hart.” In the center of the paper there was a much larger, though unmistakably similar design. That one was not colored, but within its outline were several lines of carefully printed words:

I am sory you dont have a hart. My
mother says your my magination but I
no your real and I think your nice.
Will you be my valentine?

For a long time Ghan sat motionless in the summerhouse. The February wind coming over the winter fields rattled the rose vines and ruffled his cilia. The sheet of paper in his hand fluttered every now and then, and each time he heard the sound he looked down at the incarnadine hearts and the sprawling simple words.

Finally he got up and moved over the dead mounds of last summer's garden towards the buildings. He went around the corner of the barn and he approached the small white dwelling behind the barn.

The little girl was standing on the porch steps talking earnestly to a disheveled doll which she had propped upon the railing. She did not notice his approach and he stopped some distance from her, standing quietly in the snow.

He waited until she turned and saw him, and then he slipped into the blue depths of her eyes—

The clearing *was* a garden. There were quaint multicolored parterres and green pathways. There were alabaster fountains and the laughing sound of water. There was sunlight and warm summer air.

He walked through the garden, gently. He came to a stream of blue

water with a delicate bridge arching over it. He stepped onto the bridge and looked down into the clear untroubled water. A bluebird flew down from a white cloud and perched upon his shoulder.

From the bridge he could see the forest. It was a dark forbidding forest and it grew riotously all around the garden. Even as he watched it seemed to move in closer, and abruptly the bluebird on his shoulder flew away—

The little girl was regarding him solemnly. “I came to thank you for your valentine,” Ghan said. “It was very beautiful.”

“You were gone away and I didn't know if you'd be back,” the little girl said. “But I left it just in case. Will you be going away again?”

“No,” Ghan said. “Not for a long time.”

FROM: Ghan, Supreme Arbiter
Field Base I
Sol III

TO: Administrator of Alien Cul-
tures
Stellar Headquarters
Sosterich III

GENERAL: Any governing body, in order to attain objective judgment and in order to have the right to eliminate whole civilizations, or fractions thereof, as a consequence of that judgment, must possess two pre-requisite qualities: (1) Divinity; (2) Omniscience. It is the considered opinion of the Supreme Arbiter that the present Sosterich governing body possesses neither quality (1) nor quality (2).

It is the further considered opinion of the Supreme Arbiter that the branch of the present Sosterich governing body, known as the Administration of Alien Cultures, is opinionated, impetuous, and unreliable; and

that the subdivision of the Administration of Alien Cultures, known as the Office of Perimeter Research, is incapable of seeing one micromillimeter beyond the collective proboscises on its collective countenances.

SPECIFIC: The Sosterich Federation is the oldest known civilization in the galaxy, yet in the very heyday of its intellectual maturity it is apparently immune to the basic truth that the future of any race should not be extrapolated from the minds of those who are its administrators today, but from the minds of those who will be its administrators tomorrow.

The potential future of Sol III has nothing whatever to do with the appalling present of Sol III.

Its administrators-to-be await our guidance.

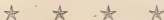
REQUEST: (1) That the present Supreme Arbiter be transferred to the Office of Alien Guidance and,

(2) That he be assigned to duty on Sol III immediately.

To: Ghan, Director of Alien Guidance (Temp.)
Guidance Center I
Sol III

FROM: Administrator of Alien Cultures
Stellar Headquarters
Sosterich III

GENERAL: SPECIFIC: Request granted.



SCIENCE FICTION: A COMMENT

OUR interest in science fiction is somewhat more than that of pure entertainment value; most of us, I believe, genuinely feel that it is of high importance that human beings learn to think in terms of a technical age. Once, business executives were almost uniformly lawyers, or men educated in a general Liberal Arts course. Today, a high percentage of executives are technicians—because only a technically educated man can correctly interpret the world of today.

People in general, however, have not yet accepted that this is not the *end* of technical advance, but the *beginning*. The importance of science fiction, aside from its purely entertainment value, lies in its influence in orienting people to appreciate that fact. "Technology exists; technology will change. All right, but so what? What does it mean to *me*? I'm no engineer."

The increasing acceptance of science fiction is simply the direct result of an increasing acceptance of the fact that technology will affect us, our lives, our security, without our individual choice, unless we choose to learn enough about it to choose.

The technological age has now reached a point where we can't live without it—and we can't live with it, if only a few of us understand what it means.

The Editor.

GIMMICK

By KATHERINE MacLEAN

When an individual thinks he'll lose the fight, he runs. When he thinks he can win the fight, he attacks. And neither one of these actions really requires thinking. But there's nothing so effective as a complete and total stalemate to induce cogent, rational thinking!

Illustrated by Vidmer

A DISTANT boom rattled the corridor.

Bob Calland passed the ammunition and sucked a cut finger, tired and sweaty, his arms aching from the weight of the small heavy space torpedoes. He wondered briefly if he should recommend that torpedoes have rough sides for gripping, and then had the further precise thought that whatever his answer to such problems, they would not appear on a report.

Any ship whose loading system was cut in the first enemy blow was not going to survive. That included him.

It was amusing that the small spaceship had come out merely to target test a new homing rocket that was supposed to be effective against the evasive speed of Furry ships. In the stories it was inventions which saved everything at the last minute.

The loading stopped inexplicably, and he straightened and stood breathing deeply, counting the probable time left to the crippled ship. It was very little.

"Time to invent another gizmo," said Calland, and laughed hysterically for five minutes, at the end of which time the badly disco-ordinated loading system resumed flow and he passed some more ammunition.

The air pressure began to drop and

the hollow boom of slamming air-compartment walls came closer. The spaceship was being carved apart, its insides opened out to the airlessness of space.

Ten minutes later it was all over. Bob Calland found himself in the dark with a feeling of falling slowly from a great height which slowly became the familiar sensation of weightless floating. The ship's spin had stopped somewhere in a dimly remembered interval of jolts and dizzy spinning of walls, with the lights flickering on and off and tremendous bewildering noise. The air was thin, but it was still there; he could still breathe. And the noise had stopped. The Furies had the ship.

He wondered if they were searching through it for survivors, and remembered that he had the insignia of a high-ranking technical officer, the rank they had assigned him for mobility as an observer from a Design Research and Testing base. If they found him, they would question him. If they had noticed that the few torpedoes they had ducked seemed to be of a new design, they might be specifically searching for the observer. They might be looking for him. With a minimum of motion he began stripping off the insignia from his sleeves.

The motion set him spinning weightlessly. In the dark his hand brushed clothing that was not his. Someone else's clothing. It was completely unexpected, for he had had no feeling of anyone being close to him. As he yanked his hand back reflexively his fingers brushed across something else that felt like soft lumpy leather. With instinctive revulsion, he pushed, and something heavy and limp gave inertly and drifted away.

A dead man.

His throat went stiff and his neck hair prickled, but he saw the practical aspects of what he had found, and he forced himself to think about what he should do. He and the body were drifting away from each other now. It had insignia on its shirt sleeve which would indicate a man who would not know enough to be worth questioning. He had to find it in the dark and change shirts.

Calland waited until he drifted into contact with the opposite wall then pushed himself back in the direction he had pushed the corpse.

After he had left contact with it he realized that the wall had been warm, almost hot, and flat instead of curved like the usual corridor walls. It was one of the air-preserving walls which had fallen between himself and the rest of the ship, and something was heating it on the other side. It was possible that the Furies were on that side, cutting through. He floated in darkness and silence as thick as black cotton. If they were cutting through the walls to get at him, why the eerie silence?

Absolute darkness. Drifting, he stretched his hands out before him, steeling himself against the fear of that dry soft leather touch he had felt before.

Then he wondered if he had turned without feeling the turn, and had a sudden conviction that he was stretch-

ing his hands towards where he had been, drifting backward into the embrace of a dead body. He began to swing his arms in sudden panic, just as his left shoulder touched something smooth and flat and searingly cold. Before he could check himself, an elbow jolted into the cold surface and shoved him away from contact.

He drifted, spinning around and around in the dark, his shoulder tingling from the icy contact.

That had been a wall. But it had been too cold.

Almost as cold as space.

He realized then the reason for the silence. There was no sound from the remainder of the ship because the remainder of the ship was gone. The small boxed-off section of corridor where he was floating along, a fragment of ship in the frigid cold of space, heated on one side by the violence of unshielded sunlight.

That meant he wouldn't have to change his shirt with the corpse. He relaxed and floated numbly without thinking. In the dark, cold and silence he could have slept or been unconscious without noticing when he slept or woke. Sometimes he would feel a wave of heat or chill just before he drifted into a wall in the dark, and would shove off hastily from a surface that would cling to his fingers as he touched it, scorching with either heat or cold.

He did not expect to be rescued.

Eleven hours later he was picked up and treated for scorch and frostbite and given hot drinks and soup, and allowed to take a long comfortable hot bath.

After he was dressed, combed and comfortable he still felt odd, as if something permanent had happened to him. He looked soberly at himself in the mirror for a while, trying to find a difference in his face, then gave

up curiosity on the subject and called base.

A husky blonde woman appeared on the screen, with a calibrator in one hand. "Calland!" she spread her arms in a gesture of embracement.

"Hello, Della," he smiled a little.

"They told us there wasn't anything left of the ship but small-sized pieces, and it looked as though the Furries had towed away the control cabin to examine the gizmo. We thought the Furries had you." She looked worried to illustrate. "They said there weren't any pieces big enough for survivors. Where did you go, boy?"

"I was in a small piece." He found himself smiling again, without it touching the frozen feeling somewhere inside.

She inspected his face. "As long as it's one piece at a time, we don't mind. How about transferring back to base and designing where it's safe? You're too productive a man to be floating around in pieces."

She added, "Especially in small pieces."

In peace time he had been working on better self-accommodating electronic readers to make punched tapes for controlling machine tools to produce machinery accurate in the fitting of its parts from inaccurate and approximate blueprints. And as his special love he had been applying self-accommodating and proportioning to a console color player which made unified color compositions from the sound of symphonies.

He stated his feeling more precisely than he had understood it before. "I don't like weapons."

"Then why test them?" She was startled, but saw the answer in what she knew of managing idea men. "O.K., I see it. No like . . . can't think . . . not top thinking anyhow. Go ahead and test, you know what

you're doing. But don't let the Furries get you."

She was about to switch off, but thought of something. "Did you hear the radio flash? We bombed the Furry settlement on Illar four hours ago. Retaliation for those beam swaths their cruiser cut across New Boston. The bombs left that settlement flattened out. It didn't have any defenses that worked."

He felt cold suddenly, his skin numbing again, understanding what would happen next, where he would not have understood before. Most of humanity was unused to the simple logic of catastrophe. He had two cousins and a girl friend in New Boston, the city nearest to the Furry planetary group. "What did we do that for? What is that supposed to do for us?"

She was indignant. "It will show the Furries that they'll find life easier if they stick to the rules of civilized warfare and leave cities and civilians alone."

Knowing that he was being absolutely accurate, with the certainty of pointing out that the sun will rise, he said, "They are going to send a cruiser back to New Boston and burn it as flat as a piece of burnt toast." He added, "As a lesson to us not to attack cities and civilians. Someone I know lives there."

The handsome blonde woman looked whiter than usual, as if the tone of his voice had made it seem real.

He began to follow a glimmer of thought, some kind of a pattern that was thinking he had done and forgotten in the long wait in the corridor. "What would happen if we tried to bomb a human city?"

She was used to having research thinkers asking rhetorical questions to bounce their ideas from her. "They'd turn on their EG screen. Our bombs couldn't touch it."



"What if the Furies had the EG screen?"

"That isn't likely. Everyone agrees the EG screen was discovered as a fluke. Two centuries of study and we still don't know why it operates." She abandoned abstract discussion. "We have a new wrinkle in a distant space-ship spotter, uses information probabilities to reconstruct shapes. It's already on its way out with the fleet to be tested, but we'd rather you did it. Check it at maximum range for shape discriminations."

When he picked it up it was a built-over civilian sportster. He reported in to the fleet command on the way there and was relayed to scout command who informed him that a Furry cruiser had been seen outside of the system heading in toward Mark II, and he was temporarily assigned scout work to test the new device in action.

Calland ranged in space, scanning the arc that had been assigned to him. The sportster, though small, was comfortable and warm and well lit, and a bell rang on the screen whenever anything of ship shape registered, so that he did not have to watch constantly but could look up from whatever else he was doing. He passed his time reading light magazines, occupying the surface of his mind.

Whenever he read the same paragraph over and over for more than a

minute he became curious and checked the current of his thoughts to see what prevented him from concentrating. It was always the same problem. How could he smuggle himself inside a Furry cruiser.

The plans he thought of were difficult, devious, and unlikely, representing the fact that the problem was not easy. He discarded them for one reason or another, and immediately began to think up another.

It occurred to him that his single-minded concentration was fanatical, and a psychotherapist would object to it. And it also occurred to him, with equal logic, that this abnormal concentration was very likely to find an answer, if there were any answer.

The Furry cruiser, when it came, came in from an angle which was a long way from his sector. The scouts were well placed, and the radio announcements of the cruiser's position and direction preceded it and widened on either side like a bow wave. His was the eighth scout to send in the cruiser's course co-ordinates, but they were taken from a distance supposedly completely out of range of ordinary detection, and he continued to keep the screen focused on the cruiser, following it in towards his planet by screen only, since the scouts were ordered to continue scouting their sectors and report any further appearance of ships.

The ship was huge on Calland's screen, bristling with slice beam antenna, many times as big as a human ship, and, he knew, almost impregnable to projectiles. Not one had been captured or inspected, and the secret of the slice beam was not known. The ships seemed close to being floating cities, and there were so few of them that the theory was that these were the ships the Furies had entered the star cluster in as colonists a generation back.

The cruiser went by at normal speed, coasting silently without radio static, an impressive murderous sight. Calland knew that it was equipped so that its crew could withstand accelerations and quick turns of maneuvering almost a third faster than the best ship of humanity, and that they were so well powered for their weapon that the ship could stand off out of projectile range and carve the smaller ships into chunks before they could get close enough to begin fighting.

Besides the compulsive drive of his plans, there was curiosity. A Furry cruiser would be a treasure trove of new gimmicks inside. The problem was, how could he get into one?

The commander of the fleet had some similar idea. He was supposedly organizing his defenses merely to keep the cruiser from getting through to Mark II, but the Furry ship instead ran into a trap.

Row on row of ships, half the fleet, ranked one behind the other in eight rows, the heads of the lines pointing directly at the approaching cruiser so that each line seemed only to be one ship on the enemy's screens.

They did not seem a threat, although they approached from different directions, for they could be easily dodged or beam-sliced before they came within projectile range. The cruiser coasted on.

On Calland's special screen, with information-corrections removing all the waver and uncertainty of distance, the lines of ships converged on the Furry at high speed, like eight arrows. They held complete radio silence, but at the planned moment every second ship of every arrow veered slightly to one side. There were two arrows where each had been before, again half of each veered and there were from sixteen arrows, thirty-two, then sixty-four ships, visible on the Furry screen, in range of the Furry beams, some of them caught and falling apart like sliced apples, but still coming with momentum, converging on the single huge cruiser. One more sidewise thrust and then there were no more lines, only individual ships which finished the pattern with an outflinging of mines around them, and it was done.

The Furry ship was totally englobed in a tightening sphere of ships and mines—with a command to surrender thundering on its radio. Nothing could save it but the EG projectile screen thrown around them from outside. The message to surrender promised it if they ceased fire and opened their ports immediately. The one other time a Furry was crippled badly enough to be abandoned the crew took off in a lifeboat and the ship immediately melted down behind them leaving no informative pieces, but this time there was no place for the crew to go.

They ignored the warning. Beaming slice rays destructively in all directions the huge cruiser was flung forward in a wild dash to escape—plowed through a wall of mines in a series of rending explosions and scattered itself across dark space in a smear of red glowing fragments and white flashes.

From his great distance Bob Calland saw the attempt to capture the cruiser only in a fragmentary way,

and pieced it together. There was the distant sight of the perfect converging formation, outlined on the new screen in unnatural geometric clarity. His radio picked up a hubbub of orders, sputters of static and muffled clangs and booms as the radio silence went off, and his intercom televiewer was segmented for a view from the viewplate of the major battleships in a fragmentary montage of tiny pictures.

Tensely Calland sat watching them register flares and splashes of light, and blink on and off, and some suddenly shift to that blank white which meant they were no longer transmitting. Almost half of them went in the first eight minutes.

In the viewscreens of the battleships still transmitting Calland saw the Furry cruiser try to plow through the mines, saw the separating rear half visible in the flare of explosions and then in one large red explosion saw the pieces scatter outward from the explosion of the ship's drive in a starfished shaped trail of minebursts.

The mines had been set to go off only on contact with the typical alloy of the Furry's hull, and they went off on contact with any sized piece, making small pieces into smaller pieces.

While he was still staring at the screen a priority call came through on his sound system.

"Continue at alert. All technical ratings not immediately essential to the operation of intact ships stand by for repair duty. All technical ratings registered as capable of cybernetic and computer control-board repair report individually for temporary reassignment." There were more instructions to others, but he ignored them as he turned his sportster toward the distant planet Mark II and the wreckage-strewn area of battle. Being a cybernetic designer he had been

rated a qualified repair man when they gave him his uniform.

The organization behind the succession of orders that came over the general call system sounded remarkably organized and flexible for a command which in the separate planets settled by humanity had no tradition of handling any more than a small, six-ship fleet, the economic maximum for any planet in its small political quarrels with its neighbors. And the situation in which ships were badly damaged and crews killed in large numbers in spite of the EG screen was something for which there was no precedent.

He was a civilian and had gathered his expectations from the popular stories of military life, which treated the usual—almost harmless—war with the enthusiasm of a football game. Still it seemed to him that the new organization of the fleet was unmilitary, almost civilian, but flexible and efficient. The possible uses of every man and his whereabouts was kept track of by an organization that was, in operation, mainly skilfully used classifying machines, and electric card sorters.

The human factor was in the commander. The battle had been organized as a colossal gamble. If the experts could not find valuable information in the wreckage of the Furry ship, half the fleet had been thrown away for nothing.

The place where they most hopefully searched for an undamaged piece of Furry ship was the englobed area near where it had exploded. Any part which had not received enough blast to be flung away would probably have been both protected from the blast and large enough to be inert.

Calland with two other cyb men were working on the controls of the command ship. They were in the



process of repairing a beam slice through the wiring of the control board when the Furry was brought in.

He had been found snugly protected in the ship's lifeboat, crouched in its shock tank, an officer reported to the commander. The craft had been still surrounded by a remnant of its launching cradle, which showed it had never taken off. Whether the Furry was in the lifeboat because of a higher degree of importance or a lower degree of courage than the members of the Furry crew who had died in their spaceship was not possible to determine by his face. He stood straight and stared around with the Furry equivalent of a glower.

The commander glowered back good-naturedly. He was highly pleased. "Well, we got something anyway," he said to the officers around him. "What we need now is the medical department, the intelligence department, a translator and one or two weapon scientists." He went back to taking reports and giving orders over the televiewer, listening to a solid wall of televiewer screens, his feet spread and planted like an admiral on deck.

In his six-ship command before he found himself with the combined fleets of humanity under him, he had been able to handle everything and apparently he clung to the habit although there was a staff of officers behind him to whom he could have delegated almost everything that needed to be done. The hubbub from the screens was almost overwhelming, but he seemed to enjoy it.

Calland, watching, finished welding two broken ends of wire and wondered what to do with a printed circuit plate which had broken across. The parts bin was in an airless punctured section of the ship. He postponed the question and sorted out some more scrambled wire ends.

"Where's the medico?" demanded the commander, turning. "Where's the translator? How long do we stand around and wait?"

Officers made apologetic noises and ran around making hurry-up calls to various departments.

Calland welded wire ends and inspected the Furry with admiration. Furries were human-seeming, but taller, and covered with mouse gray fur. This one was exceptionally strong looking, with brown wide eyes accentuated by dark brown fur stripes; the two vertical stripes on his forehead running up over his head and down his back. He had seen Furries before the quarrel began, and had liked them as most people did, because they seemed more direct and naïve, because they were honest, and because they had no arts but operatic singing, and admired human arts, and because of some engaging quality in their open childish pride in having bigger shinier machines.

However in wartime their having bigger shinier machines made a difference. As long as the war was fought with machines—

The Furries he had seen had always worn respirator clips over their noses. This one did not and yet seemed to have no trouble breathing. Calland remembered that the respirators were unnecessary: the Furries used them only to protect themselves against the subtle smell of green growing plants and of men which pervades the air wherever man settled, and wherever plants were used for air purification. To their alien chemistry these odors were an obnoxious penetrating stench. The Furry, respiratorless, was wrinkling his dark snub nose with an occasional involuntary twitch.

The medico came in and had the captive sit down while being examined.

"Is he all right?" asked the commander, turning his head from the jammering video screens.

"Healthy so far. He needs a respirator."

"I know. He's supposed to have one." The commander lifted his voice. "Where's the respirator?"

Beside Calland another cyb tech murmured irritably. "But the medico doesn't care if *I'm* healthy. They dragged me out of quarantine to send me over here. If I didn't take pills, I'd have a hundred and two fever, and I have the itch, and everyone thinks it's funny." He scratched his neck.

"What did you say you have?" asked Calland, slightly alarmed. He leaned away and checked the resistance of a weld at arm's length from the man.

"Chicken pox," the man said with sadistic glee. "You'll probably get it. It's an old children's disease in the planets of the cluster. The planets around here probably never had it because they quarantined the settling trips. It makes you itch for two days." He scratched with a hand holding a soldering iron and said "Ouch," absently as the iron waved near skin. "What do you say the chances are that the bohunk knows anything?"

Calland ran a rough weld through a gadget that smoothed it to the right bore. "Not good. Choose a man at random out of a human crew and the chances are that he can't tell you what makes the air lock open and close, let alone why the guns fire."

The prisoner was talking to a translator and the translator was talking to the commander and the calls were buzzing and talking and piling up on the commander's screens behind him. "Where are some physicists or electrical engineers," the commander demanded indignantly. "I can't understand this gabble honk!"

Beside Calland the man with

chicken pox muttered something to himself like, "not in quarantine. Let em all itch," and stepped rapidly in front of Calland and the other cyb electronics men who were beginning to put their tools down to volunteer. To the commander he said soothingly, "I'm qualified, sir," and took the arm of the translator. "Let's find some place to sit down and talk with this fellow."

He looked at the doctor. "Can he take questioning?"

"What kind of questioning?" the doctor asked suspiciously, and turned to the commander. "He's not in good shape sir, he needs a trip to the infirmary. The air isn't doing him any good."

"Where the deuce is that respirator?" There was a muttered explanation from one of the officers. "Making one?" Another muttered in answer. The commander looked around from face to face earnestly as though asking information. "Who thought of storing everything essential in one place where the enemy could wreck it all with a single beam?" He waved at the medic. "Take him away and take care of him. The respirator will be sent over."

In four days, Calland learned, they had determined the Furry's name, place of origin, and military rank—he was a mess-steward, able to give full details on the food preparation machinery in the Furry cruisers—before he died. The exact cause of the Furry's death wasn't determined; the questioning hadn't had any reason to be of the type that might have caused it. The medical department had been overworked with other things, and by the fourth day the men weren't in a mood to be concerned about the death by rather sudden collapse of one Furry.

In exact congruence with Calland's prediction, the Furry cruisers had

paid a return visit to New Boston. It had been obliterated from the face of the planet a day earlier, with a loss of life which had not even been estimated. "We should wipe them out!"

Calland's idea completed itself. The man's viciousness confirmed his decision. He added a few more grotesque strokes to the drawing on his notebook. "Pardon me, Mac, I've got to put a quick call through to a designing base."

Impressed, the engineer withdrew.

While he was waiting for the call to go through Calland pulled another sheet of paper over to him and began carefully to draw, making mechanical notations along the side, glancing occasionally at the grotesque little sketch on the notebook.

The energetic blonde appeared on the screen as the call went through.

He said, "Della, have you any faith in my judgment?"

"Plenty."

"There's a rough drawing and description I'm going to teleprint to the custom construction department. No matter how it looks, don't call an idea conference to fix it up, just have them build it the way it is. When you see it, just say to yourself you have faith."

"Anything you design will look reasonable."

"Ha!" he said sinisterly, and cut the connection to make his next call to the construction department.

After that call he made one to the head of the radar department requesting transfer back to design base for work on a new weapon design. The request went through and was confirmed with unusual speed. Four hours later he was given a telestat of his transfer papers.

On the way back the video screen rang for him and Della's face appeared on it.

"You're insane," she said.

"Probably," he smiled slightly.

"Any reason why I shouldn't sic the brain doctors on you and have you hospitalized?"

She meant it, he saw. The question was a bad shock, for any such interference would cause more delay than he felt he could stand. He had to explain the thing they were building.

"It's a blind," he said. "A booby trap to keep the Furry scientists puzzling and distract their attention from the real weapon."

"Hm-m-m," she looked uncertain. "Where's this real weapon?"

"I'll install it tomorrow when I get there. And alone. The blueprints I'll file with you in a sealed envelope, but there's no point in the base having them until I test it and find out if it works."

"I'll back you up," she decided, and looked at him quizzically, but switched off without asking anything.

The next day when he landed at base he picked up a large box full of some kind of apparatus from the storage section of his workroom, trundled it in to the room where his new "weapon" was waiting, built into a small sized commutercraft, and locked the door securely.

Then he climbed into the craft and relaxed in the control seat with the *Journal of Chemopsychic Research*. At noon he took lunch from a corner of the box and ate it, and then took his temperature.

At three o'clock he felt slightly dizzy and took his temperature again. It was a fever. He said, "I thought so," and took some antifever pills and did not say anything else, because he had made up his mind about this long ago, but began loading the contents of the box on board the small spacecraft.

Two hours later he was out in space. He set his course co-ordinates and began to unpack tools.

The screen buzzed and when he cut

it in the face of Della appeared. "Where do you think you're going?"

"To test it."

"Testing is supposed to be done on planetoids. You're heading for the Furry system."

"I can't test a psychological weapon on rocks."

"True enough," she looked at him, inspecting his face with respect. "Even insane, you have guts enough. Well have luck." She switched off.

He was alone again. From his box he took out the works of one of his color-sound co-ordinators and plugged it in near the control board. He amused himself having it play colors in response to the tones of his voice while he took out a theramin and wired the two in together neatly. Now when he moved the motion was turned into sound by the theramin and the sound into color by the color-composer. Surrounded by a rippling play of colors, bathed in sound, and grinning, he wired the whole works into the ground ends of the meaningless antenna that decorated the outside of the communtercraft. He turned the volume down and wired more things into more things, in good logical-seeming patterns, nowhere contradicting intelligent patterns of wiring or doing anything which would make an appearance of slipshod work.

Then he went back to reading magazines, the cabin walls a quiet dancing of color in delicate, subtle patterns, responding to the sound of his breathing and the rustle of turning pages.

When the Furry planetary system came near he began to watch the radar screen. He passed the outmost blinker rocks of the Furry system, navigator's guides which swung a radar beam as a lighthouse guide to safe routes and a detector of incoming strangers.

A few minutes past the first one

and he knew he had been observed, for the randomly swinging beam swung back and focused on his ship. Somewhere on a planet a long way ahead the relayed signal had reached a screen and been seen by a Furry observer.

The radar beams picked him out and followed him like suspicious eyes as he passed one blinker after another, as somewhere in the direction he was going Furies gathered around the screens to stare, and orders were given.

Abruptly his ship-scanning screen, which had been making meaningless geometric patterns from random static, picked up definite ship shapes somewhere and focused on them. A view of spaceships swung up on magnification to total clarity. Their movements were oddly uncertain. One started in his direction then swung around again and grouped in with others in a battle formation before a planet—true defenders.

But then the entire battle formation, as though taking courage in numbers, moved forward again. They accelerated as though planning to intercept him before he came near any planet he might damage.

He knew how his speedster looked on the screen. It was a weird jumble of coils and antenna sticking out randomly in any direction. At the nose of the craft was a parabolic bowl which blew bubbles. In it grew blue glowing spheres which expanded and thinned and vanished slowly as they grew while another tiny blue sphere appeared in the bottom and began to expand.

It must at that moment have had all the available physicists in the fleet staring fascinated into their screens, cursing the failures of clarity in the relayed blinker rock pickup, worried and disconcerted because they could not think of any weapon it could be,

probably speculating about spherical force fields and other such improbabilities, looking wildly for an explanation that would fit.

They would become more worried looking for an answer, because they would not find one. It was not a weapon, merely a pinpoint ooze of hydrogen into an ionizer.

The fleet advanced toward him rapidly, their slice beams already focused in the direction they expected to first see him in their own screens. Nervously he put on a spacesuit, fumbling with haste, although there was no need for haste yet. There was little chance of a beam striking any craft out of sighting range, and with his spacesuit, if the craft were sliced into by a beam, there would still be no danger to him unless the beam nicked his spacesuit. The theramin followed his motions with disconcerted jerky flute notes, and he forced himself to relax and move more slowly as he sat. He flicked on the antenna circuits where they led into the color player and then swung back to watch the nine monstrous cruisers accelerating towards him.

They assumed it was an attempt to sneak past the defenses and inflict vengeance on one of their planets for what had been done to New Boston. They were rushing forward to defend their home population and crush the menace quickly before it could come within range of their cities.

Except for a penknife in his inner shirt pocket, Calland and his speedster were unarmed and defenseless. He judged that they were close enough to be seen on ordinary radar, and swerved the craft slightly as if he had just seen them, then smiling, reached to a special switch and turned on the display. Four colors of neon and fluorescent tubing flashed on and showed themselves wrapped in a gigantic and bril-

liant helix. At the spectacular sight the great speeding cruisers scattered like a covey of quail at the sight of a hunter and fled back toward the planets and the protection of its satellite based beams.

The commanders had been faced with the same choice as the human commander of the week before. What if the helix could destroy ships? Would it be worth losing the entire fleet to defend one planet?

Furry thinking was never very rapid, but it came to logical conclusions. Halfway back to their sheltering planetary bases, one of the eight ships swerved off and turned to face the mysterious helix, a suicide volunteer to test the efficacy of its weapons and give the others some warning of what to expect from the incredible thing which rushed at them.

Here I come with my secret weapon, thought Calland, stepping on the jet pedal. Here I come to be questioned, all wrapped up like a Christmas package. You wanted to question me, and now you are going to do it.

Behind him the color player had begun to play colors in response to the shifting magnetic lines of the planetary fields they were approaching, with faster rhythms that were minor ripples of current on the hull and the leakage of current from the surface of the neon tubing, a sequence of ripples and polka dot flashes over the slow color changes of the magnetic lines. He gave it a quick glance now and then, admiring its mechanical attempt to organize a symphonic composition out of something random. The theramin let out a mooing horn note in response to each turn of his head. He waved a free hand from the controls up and down in a rapid sweep and was rewarded by a fire engine's wail.

Under the other sounds an alarm

bell began to jangle quietly, meaning that the Furry cruiser that was waiting for him had come within range and was opening fire, slicing at the speedster with its beams, finding the range.

The accident was ready. And it would be plausible.

He stood up half out of the pilot's chair and swung the wheel a sharp turn to the right. The craft bucked and surged to the side with an obedient roar of side jets and as the jolt began to throw him to one side he grabbed at a bundle of wiring neatly cased in a transparent cable case, grabbing as if to save himself. He hung on for a moment against the rocket roar and the sidewise surge of the ship and then the wiring began to rip loose from its connections. There was a series of sharp sputters, a spattering of blue flashes, and a jolting *spat* which he could hear transmitted through the hull, as outside, in the helix around the ship, half of the tubing flared up to overburdened brightness and blew up with a lovely display of far-flung sparks, while the remainder went dead.

The color player coruscated in flashes of spattering pinks and greens and then the cabin went black as its wires pulled loose and Calland pitched across to the opposite wall with a handful of wires and landed against a shielded tessla coil.

The tessla coil sparked but did not blow out, and he lay comfortably in the dark a moment watching ripples of harmless high-tension surface electricity run across one spacesuited hand in brilliant blue fire, until the cabin fell apart in two neat halves on either side of him like a cleaved egg.

Then he was drifting, but it was not dark. He was floating in space surrounded by stars with the two halves of the speedster drifting away from him. He thought he saw another small section come away from one

half and wondered if they were still slicing with the beam. The rueful thought came that with a slicer beam an extremely cautious Furry could make very small pieces of anything he distrusted, with few problems in reassembling the pieces for information afterward. *However*, he thought as he watched one half section of the cabin definitely separate into two smaller slices, *they wouldn't get much information by reassembling me.*

He decided that he did not like the suspense. It would be better to pretend to be knocked out and close his eyes.

After a moment it was not pretending. Bob Calland had been overworking for days, had had a fever for which he usually forgot to take antifever tablets, he was tired, frightened, and had just gotten a good jolt on the head. Now suddenly there was nothing to do but wait with his eyes closed. He fell asleep.

He remained asleep until the Furies had him inside their ship and stretched out on a table.

When he woke up they were talking all around him with great excitement, and noticing he was awake, they began crowding one who was obviously the interpreter to interpret their questions.

"What did you try to do?" the interpreter asked. The engineers or tech men were not in the crowd, probably they were out bringing in the parts of the speedster and its strange equipment. Perhaps they were assuming that the prisoner had nothing to do with the design of his weapon, and would not be able to explain it.

"What was the thing for?" asked the interpreter.

Calland decided that the easiest way to give the impression he had secrets to keep was to look like he was.



keeping them. He looked at the interpreter defiantly and refused to speak.

After he had refused to answer polite requests and reassurances and refused to answer shouts they began to grow interested. What secrets could he be carrying of such importance that he dared not answer even a small question?

They set about finding out.

After he refused to answer under more careful coaxing and threats they began to grow annoyed and baffled, and tried to make their threats seem more sincere by punctuating them with slaps. They were inhibited by their own traditions of civilization, but felt a reasonable urgency to find out anything of importance to their survival. If it was a matter of life or death, they would choose to survive on any terms, even brutality.

The slaps grew heavier. Finally Calland decided that he had held out long enough to impress them and began to talk.

He sat on the edge of the table and answered questions, then when the engineers came in from their first attempt to piece his craft together he stood in the workroom of the cruiser where they had parked it and pointed

to where circuits should go and how they should be wired and answered more questions.

There was no way they could check whether what he said was true or not, for they had no truth serums chemically fit for humans, but the wire endings seemed to match and look reasonable the way he had them do it, although the experts were increasingly puzzled about how it operated and what it did, and spent much time arguing with each other.

The questions came from an ever growing assortment of experts, some from the others ships of the fleet, and some he began to suspect were from the planets. They seemed increasingly intelligent and likable as their number grew. For two days he answered questions, telling the truth wherever possible, and in answer to questions about the purpose of his weapon,

adding lie on lie, very carefully fitting them together in a logical sounding fantasy as a diverting game. He liked his questioners, and was sorry for them.

They were being pleasant to him, now that he was answering, and occasionally one would remark to him that he was a civilized person; that, judging by their warfare, they had come to expect all Balds to be savages. He did not comment on this, merely made friendly remarks back and tried to tell the mathematicians the basic formula of the EG field.

After a time he found a young one versed in the right branch of electronics so that he found it easy to interpret the interpreter's vague translation. Calland buttonholed him and forced him to listen long enough to get the entire equation and the basic design.

The others were impatient at the duration of his diversion from the essential business of instructing them in the secret weapon, but the young scientist Calland had confided it to went away rapidly, looking preoccupied and intent on something he was planning to do. Calland hoped he had fully understood, and that he would pass on his information to other Furries before it was too late.

Calland was sorry for him.

He was sorry for the crew, for every man of it had taken time off to see him during the first hours he was aboard. Every cyb weapon expert had been into the workroom to puzzle over the network that the engineers were trying to reassemble under his directions. By the end of the second day he had seen vague friendly Furries enter who received so much deference and understood so much without questions, that he was sure that he was getting the cream of the theoreticians from the

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Furry planets, and he felt increasingly guilty.

At the end of the second day, under his directions they finished reassembling the speedster, interior and exterior, and were still unable to understand its function as a weapon.

They began to argue and discuss among themselves, and some came over and shouted vehemently in their own tongue that it could not work—it could not possibly work! There must be something wrong about the way it was assembled.

After a long discussion, after parts were taken apart and put together as before over and over, after parts were energized separately and watched in operation they wired the whole thing together again dubiously and suggested to Calland that he prove it was a weapon by turning it on.

He resisted, holding up his role, pointing out that it was dangerous.

They did not believe but they arranged to be away from the danger area. Confronted with a threat Calland shrugged, walked over to the speedster, climbed in and switched everything on. It went on and flashed, coruscated and buzzed and shone with colors outwardly and inwardly as

before, although the blue spheres could not be made without a vacuum.

After twenty minutes he turned it off and climbed out again. Then the most important scientists came back from the distant ships where they had taken refuge and examined the films of what had happened and the graphs of radiations emitted, and declared that the thing was not a weapon, that all the flashing and glowing and cybernetic interplay produced nothing.

Calland shrugged and ceased to answer questions. When they found he would not speak it was suggested that they try beating him again, but this group was not of the same attitude as the first one and many were against it. After an arguing uproar they compromised and decided on bright light and no food or sleep, to wear his nerves down.

The night was not comfortable, but Calland found it easy to endure, for he was not inclined to sleep anyhow, knowing what was coming.

In the morning crew members began to die. All the officers were found dead first, and then the others began to drop. Calland walked out of the questioning room in the confusion of

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deaths and locked himself in some crewman's cabin and listened to the hoarse shouts and the feet running past the door. They were not looking for him. The shouts were of fear. They remembered that the weapon had been on the wake period before, and thought the deaths were from that. They were not sure that it was off, or if, once having been on, it remained on and killed men within its range apparently choosing them at random.

The cries and running feet emptied out of the ship into lifeboat rockets. The ship was abandoned.

Calland put his ear to the wall and heard no shuffle of movement left. He could hear his own breathing in the silence.

The ship was empty.

No other cruiser pursued him as he steered his captured Furry ship out of their planetary system and set it going in the direction of Mark II.

By the time he reached the Mark system and turned the ship over to Design and Research the Furies had broadcast a surrender offer, and a desperate appeal to turn off the weapon, wherever it was, for, they explained, it was still killing, more and more every day.

Calland felt guilty. He had not been able to think of any way to warn them that it was a disease and still capture the ship.

The human alliance conferred on the surrender offer and agreed on vindictive and punishing terms equal to their angers and the wounds humanity had suffered in the unprecedented savagery of the war, terms which were intended to humiliate the pride of the furried race.

By the time the term were presented however, the Furies had discovered that their deaths were from a virus disease, and had it successfully quarantined. A week later there was

an EG field over every Furry city. They retracted their surrender offer, and prepared to defy and resist any attempt to enforce the peace terms of the humans.

Humanity's cities hastily put up the antibeam shield learned from the captured cruiser. Humanity's ships were equipped with anti-slicer beam shields which made them immune to Furry ship attack, and also were given slicer beams which turned out handy for target practice and mining asteroids, but could not get into shielded spaceships.

It was no longer possible for either side to materially hurt the other. "Civilized warfare" had returned.

And so the war stopped.

Humanity and the Furies gradually began to conduct business together and grew friendly again. Bob Calland prudently kept himself from being a target for the wrath of the surviving Furies by claiming he had not expected to carry chicken pox: he had merely built a weapon which did not work, and so accidentally carried the disease. Without either assassination or acclaim, he was permitted to go back to his civilian trade of designing color composers and cybernetic blueprint translators which would punch machine tool control tapes for the building of accurate machines with interfitted parts from inaccurate sketched blueprints. He no longer had to float around in dark fragments of ship entangled with stiffening corpses, or look at the stacked bodies of furred fellow cyb and network techs. Being a civilian by nature and training, he had no stomach for people being dead anywhere where he could know about it.

A psychotherapist cured him of nightmares about the dark, which for a time were somehow confused with an odd idea that the last war had gone differently and there was nothing left but corpses.



THE REFERENCE LIBRARY

By P. SCHUYLER MILLER

SURVEYING BRITISH SCIENCE FICTION

(This month's department has been contributed by a guest reviewer who keeps in touch with British science fiction and fantasy publishing. Mrs. Dirce Archer, who is well known in fan circles for her drawings and commentaries, is a founder and present Director of the Pittsburgh Science Fiction Association.—PSM)

DESPITE the perennial popularity of the science fiction written by H. G. Wells, and by a few others such as A. Conan Doyle and Olaf Stapledon, British science fiction has not developed much until fairly recently. Even during the years just past not too much has been written that can be called pure science fiction. But then what two people can agree on what

that is? British publications, outside the pocketbook field, have had a strong bias towards the fantastic and the supernatural, and this tendency still prevails. There is also a tendency to consider science fiction not quite respectable, such as existed here until recently. Much that is written today and labeled science fiction seems more to be unintentional borderline, or deliberate fence-sitting, making it almost impossible to separate fantasy and science fiction when writing about the genre as it presently exists in Britain.

The straight science fiction books currently being published are mainly British reprints of American titles. This creates the unfortunate situation, that excellent and readable books that are "British only" are rather scarce—or perhaps one should say fortunate

when the quality of many is considered. This statement does not imply that good science fiction is not published in Britain, for it is. What it *does* mean is that most of their top-quality books, such as "The Sand of Mars" or "The Day of the Triffids" ("Revolt of the Triffids") are reprinted over here, just as our science fiction is reprinted across the Atlantic. Since the number of science fiction and fantasy books that appear in Britain is only a trickle compared to our copious flow, it can readily be seen that when reprints in both countries are subtracted, the meager remainder cannot be, as a rule, of their best.

A decided contrast appears when one compares conditions facing British and American science fiction authors. Very few "British only" science fiction magazines are published: *Authentic*, *Nebula*, *New Worlds* and *Science Fantasy*, with three pocket-sized magazines that are sometimes listed as pocketbooks, *Futuristic Science Stories*, *Tales of Tomorrow* and *Worlds of Fantasy*. British writers have the problem of a very limited native market and so must look to American publications to see their work in print. Our magazines also pay much higher rates—this is, of course, greatly to our advantage as some British authors are very good indeed. Here, on the other hand, with our current flood of magazines and deluge of hard-cover books, we do not have enough good writers to spread around. The thin veneer of good material barely covers the terrible tripe that is inflicted upon us only too often.

Oddly enough, although so few "British only" magazines are published, a great many United States magazines—including ASF—are reprinted in England, and their number is increasing. These British reprint editions—known as "BRE's"—are

usually incomplete reprints of issues published here several months before.

The scarcity of "British only" science fiction does not, sad to relate, apply to pocketbooks, for the presses—somehow side-stepping the paper shortage—roll on, pouring forth gadget-gimmick-ridden trash. The majority are what I call bathtub literature: one can read them there in perfect safety, as one can drop them, dunk them, destroy them and never shed a tear for the departed. Some, admittedly, have a certain peculiar fascination of their own, and some are really good, but the latter are few in number compared to the expendables. E. J. Carnell—editor of *New Worlds* and *Science Fantasy* Britain's two leading short-story science fiction magazines—says in a recent *Operation Fantast*: "Several titles . . . have been pronounced 'almost readable' by the fussiest of fans! Personally, I will agree an improvement is noticeable, but there is still room for considerably more 'improvement' before most of them become 'readable,' except under duress."

The foremost companies publishing original science fiction pocketbooks at present are Curtis Warren Ltd. ("Curtis Books"), Hamilton & Company ("Panther Books"), and Scion Ltd. ("Scion Scientific Novels"). These three publish "British only" (although Hamilton has just issued S. Fowler Wright's "The World Below" as their forty-fourth "Panther"), and of the three the selections of Hamilton are occasionally quite good. Several publishers who produced science fiction in 1951 did not continue to do so last year, but others (Archer Press Ltd., Brown Watson Ltd., Edwin Self & Company Ltd., Gaywood Press, John Spencer & Company, Milestone Ltd.) took their places with such enchanting titles as "Curse of Planet Kuz,"

"Freaks Against Superman," and "Planetoid Disposals Ltd." These companies print the variety of science fiction described earlier, with nightmare-producing covers—ours are mild in comparison.

Other pocketbook publishers reprint both British and American science fiction and fantasy. Pan Books and Gorgi Books are among these, as is Kemsley House with its well-known "Cherry Tree Novels." The cover of these states: "Famous American books published in the United States at not less than 10/6 and 15/ are beautifully produced in Fantasy Books at only 1/6." And they are just this—some are even illustrated—with titles ranging from such dated items as Gernsback's "Ralph 124C41+" and Coblenz's "Sunken World" to the more contemporary "John Carstairs, Space Detective" of Long and Friend's "Kid from Mars." Staid Penguin Books is evidently still waiting to see the way the wind blows, for its closest approach to science fiction is through such books as George Orwell's "Animal Farm"; it is otherwise adhering to fantasy and the supernatural.

Incidentally, the only regular "British only" books that have appeared recently are between-boards editions of pocketbooks, published either by Hamilton or by Curtis Warren as part of Curtis Books' new "Lion Library." Up to date the books issued by both companies are of the usual British pocketbook quality—that is, about the same grade as material printed in our lowest class pulp magazines.

Questioned at the Manchester Science Fiction Convention last fall, John Russell Fearn ("Vargo Statten") said "such bad stuff" was produced by him "due to the insistence of the British publishers for Space Opera, and a warning not to write 'Americanized science fiction for them.'" This

is difficult to comprehend when the quantity of United States books, pocketbooks and magazines reprinted in England is considered—they must sell, and sell well, or they wouldn't appear.

It is understandable that any nation should prefer its own individual style to develop, but it is equally non-understandable that so many British editors and publishers, to acquire a strictly British slant, should go back to the primitive slough from which American science fiction has been slowly climbing for so many years. If it is a question of protecting native industry, the necessity for the warning is not quite clear, as British authors appear quite well able to sell their work in this country, if one can judge by the quantity appearing. It should rather be a matter of mutual exchange.

To encourage a higher standard in writing, the first International Fantasy Award was given at the London convention in 1951 (full title: "The Annual Award for Artistic Merit in Creative Fantasy") in the shape of a table lighter, a twelve-inch rocketship mounted on a mahogany base. The fiction award last year was granted to John Collier for his "Fancies and Goodnights," with second place (rewardless) taken by John Beynon Harris' "Day of the Triffids." Apparently—though there is confusion among the accounts we can find—it was Bradbury's "The Illustrated Man," which took third place. All were published here by Doubleday.

The nonfiction award, not unexpectedly, went to Arthur C. Clarke for "The Exploration of Space." Willy Ley took both second and third places with "Dragons in Amber" and "Rockets, Jets, Guided Missiles and Space Travel."

The International Fantasy Award

Committee, as of last year, has the following permanent Adjudicators: British—Fred C. Brown, bibliophile; John Carnell and Walter Gillings, editors; John Beynon Harris and J. M. Walsh, authors; and Irish fan Walt Willis; French—Georges Gallet, editor-publisher, and Igor Malewski, editor; Swedish—Sigvard Ostlund, bibliophile; and American—Everett F. Bleiler, Boucher and McComas (acting as one) and Groff Conklin, editors; Basil Davenport, reviewer; August Derleth, editor publisher; and Willy Lew, Judith Merril and Wilson Tucker, writers. Messrs. Harris, Ley and Tucker could not participate in the judging in 1952 as books of their own were entered in the race.

This year the award will be announced at the London Convention the first of June, and will be history by the time this appears.

British publishers, who have been more or less sitting back awaiting that real judgment of the reading public—sales—have evidently been satisfied with the results. At any rate, a British book club, "The Science Fiction Book Club," has been introduced by Sidgwick and Jackson. It can be joined by anyone, anywhere, if mail facilities permit books to be sent. Members outside the British Isles, however, must subscribe to the first six selections in one lump payment of thirty-nine shillings (\$5.50 for United States and Canadian subscribers); otherwise the books are only 6/6 each (a shilling is currently fourteen cents).

The club's judges, Arthur C. Clarke, E. J. Carnell, Dr. J. G. Porter and Edward Shanks, have selected the first three titles as follows: March/April, "Earth Abides," by George Stewart; May/June, "The Martian Chronicles," by Ray Bradbury; and July/August, "Last and First Men," by Olaf Stapledon. The club sends

with its selections "The Science Fiction News Sheet," similar to pamphlets distributed by book clubs over here.

A jacket blurb informs one that "From America, land of Science and the Machine, comes a new kind of book." Since we are getting credit where no credit is due, perhaps I should first survey those American books which have been reprinted in Britain before closing with reviews of several "British only" books which are typical of current production.

1951 saw publication of: "The Best Science Fiction Stories," edited by Bleiler and Dikty (*Best of 1950* with only eight of the original thirteen stories), Greenberg's "Men Against the Stars" (again eight stories) and van Vogt's "Voyage of the Space Beagle," all from Grayson & Grayson at 8/6 (\$1.19); Ehrlich's "The Big Eye." Cummings' "Princess of the Atom" and Brown's "What Mad Universe" (all Boardman, 8/6); and Hamilton's "The Star Kings" (Museum Press 9/6). For 10/6 Hart-Davis offered Ray Bradbury's "The Silver Locusts," a retitled "Martian Chronicles" in which "Usher II" replaces "The Fire Balloons." Methuen continued to bring out their seven-shilling editions by Edgar Rice Burroughs.

During 1952, Grayson & Grayson reprinted, at 9/6, Conklin's "Possible Worlds of Science Fiction" (thirteen of the twenty-two original stories), Bleiler and Dikty's 1951 anthology as "The Best Science Fiction Stories," *Second Series* (fourteen out of seventeen this time: the first has run to two printings); Asimov's "I, Robot," and the Healy-McComas "Adventures in Time and Space," cut to a meager ten of the United States edition's original thirty-five stories, were 10/6. Healy's "New Tales of Space and Time" (the only American short story collection reprinted complete in England of

which I know) came from Weidenfeld & Nicholson at 10/6 and van Vogt's "Weapon Shops of Isher" at 9/6. Hart-Davis reprinted Bradbury's "The Illustrated Man" (eighteen stories) at 11/6.

Thus far in 1953 (late May) Bodley Head has issued Crossen's "Adventures in Tomorrow," with thirteen of the fifteen original stories, for 10/6 and Grayson & Grayson brought out a much-abridged "Galaxy Reader of Science Fiction" at 9/6. An abridgement of the "Astounding Science Fiction Anthology" is scheduled for late spring. Eyre & Spottiswoode has published van Vogt's "Destination: Universe" and Weidenfeld & Nicholson has "The House That Stood Still," both at 9/6, with "Slan" promised later. Museum Press has scheduled publication of Russell's "Dreadful Sanctuary," Heinlein's "Puppet Masters," Williamson's "Dragon's Island," and "The Blind Spot," by Hall and Flint, and would, I understand, like to bring out one of our series such as E. E. Smith's "Lensman" books. Sidgwick & Jackson will publish Heinlein's "Future History" series, and Arthur C. Clarke's "Prelude to Space"—which was published here only in paperbound form—is also promised by them.

Haggard enthusiasts will welcome the news that Macdonald is adding to a growing list of Haggard reprints. The latest, illustrated like the previous volumes, is the scarce "Child of Storm" at 8/6. The Macdonald Illustrated Edition of Haggard has so far included "She," "Allan Quatermain," "Montezuma's Daughter," "Nada the Lily," "Eric Brighteyes," "People of the Mist," "Allan's Wife" and "The Brethren." A biography of Haggard by his daughter, Lillias Rider Haggard, "The Cloak That I Left," was published in 1952 for eighteen shillings.

Before turning now to individual reviews of "British only" books, ASF readers may be interested in the adventures of "John Wyndham's" popular "The Day of the Triffids." As originally written, the deadly Triffids evolved in Russia, but Doubleday did not care for this version. Rewriting, Mr. Harris changed the point of origin to Venus, but his version did not suit Doubleday either so they published the first account, deleting ten thousand words. Meanwhile *Collier's* serialized an abridgement of the Venusian idea. The British edition is the original, complete book and much the best of the three varieties.

THE OTHER HALF OF THE PLANET,
by Paul Capon. William Heinemann
Ltd., London. 1952. 255 pp. 12s. 6d.

Those who have read the forerunner of this book, "The Other Side of the Sun" (Heinemann, 1950. 10/6), which was very successful as a BBC serial, will be glad to know that the sequel is a much better book.

"The Other Side of the Sun" dealt with a trip to Antigeeos, an imaginary planet sharing Earth's orbit but forever hidden from us on the other side of the Sun. Six explorers find on the northern continent a brown-skinned race more advanced than theirs. The book ends with the villain, McQuoid, escaping to a southern continent while the young married couple, unable to leave because of an expected child, watch their ship take off but explode in midair.

"The Other Half of the Planet" takes up the story of the three who left for Earth. Their booster-rocket bursts and the *Skylark* falls in the mountainous southern continent of Antigeeos, which has a slave culture brutally ruled by half-human albinos.

The globular spaceship is sledged

six hundred miles by the grayish helots, who must live with their jaws clamped shut with metal bands to the honeycombed volcano of their masters. These people have evolved a horrible culture. The stupid albino rulers, in a long-past Age of Calamity, starved the brown people into submission and now regulate the right of their males to live by the number of metal hats available—a brown-skin woman applies for one repossessed from the dead, on the birth of a son. The albinos themselves keep only the strongest alive by a series of elimination bouts, fought with obsidian knives by adolescent youths. The slaves are hybrids of the two races—"mules."

A behatted one becomes friendly with the three from Earth, as he wishes to learn a language not intelligible to the overlords. He helps them make a balloon from the *Skylark's* parachute. McQuoid turns up, is nursed to health, and promptly turns informer but is killed for being one of the foreigners. The slaves, seeing a prophecy fulfilled, revolt and the Earthmen blow up the albino's idol, start a volcanic eruption, but escape by balloon to the northern continent again.

The book's last lines leave the door wide open for a third novel about Antigeos. Let us hope it, too, improves over its predecessor. There is room for it. Juvenile writing about an adult theme might be the verdict.

STAR OF ILL OMEN, by Dennis Wheatley.
Hutchinson & Company Ltd., London.
1952. 320 pp. 12s. 6d.

Hutchinson seems to consider this book science fiction, as the jacket modestly proclaims it as "rivaling the stories of Jules Verne and H. G. Wells." It is included here as an example of

how poor British "science fiction" by a usually skilled writer can be.

Our hero, on a mission to ferret out the secrets of a nuclear energy plant, mixes his love and business lives. All is discovered by the scientist-husband just as the three are scooped out the window by mindless Martian monsters and carried off in a flying saucer. This isn't much sillier than a lengthy dissertation on saucers given earlier—"sea-hook" balloons are mentioned several times.

The three find on Mars three native forms of life (beans, the universal food; the twenty-foot giants, who are well trained "man-animals"; and their masters, four-inch "bee-beetles"), plus an alien element in three Russians (including one mad scientist!). They have been kidnapped to build atomic bombs for the conquest of earth. Wonderful critters these bee-beetles—using their bodies as crucibles, they excrete substances either transparent, opaque, rubbery or with the harness of steel, with which to build their hundred-foot flying saucers.

After many tribulations and passionate love in the desert, a revolt is instigated among the giants. The kidnapped kidnap a saucer; the crew of bee-beetles flee, firing the saucer; our hero smothers the incendiary machine with his chest, blows up the saucer to prevent the bombing of London, and dives two thousand feet into the Thames with his lady-love.

An editorial note by Captain Kenneth F. Slater in *Operation Fantast*—the British fan magazine which has evolved into an international readers'-service organization—to its review of this gem says: "I LIKE Wheatley. I couldn't finish this book." I also like Wheatley and managed to stick it out, but still wonder how. It is hard to believe that the same man wrote "Star of Ill Omen," produced the

Wheatley weirds—which are wonderful—and such borderline science fiction as “Sixty Days to Live” and “Black August.”

It amazes me that some enterprising American publisher does not reprint some of the *good* Wheatleys, which sell by the million in Britain. The Wheatley weirds are good, fast-moving and almost melodramatic. “The Devil Rides Out” and its sequel, “Strange Conflict,” are the best black magic tales I have ever read. A three-decker containing these two and “The Haunting of Toby Jugg” would be a collection anyone but the most hidebound gadgeteer would be happy to own. And don’t let the word “weird” throw you: the Wheatley weirds do *not* belong to the Lovecraft-Arkham House school—they are real “thrillers” in the best British sense, that keep one on chair’s edge and up all night to finish. The newest, just received, is “To the Devil—A Daughter” (Hutchinson, 12/6).

TOMORROW SOMETIMES COMES, by F. G. Rayer. Home & Van Thal, London. 1951. 256 pp. 9s. 6d.

This, Rayer’s first novel after many shorts, is good science fiction and good reading, in the American, British or any other sense.

It is the story of the man responsible for unleashing atomic warfare and turning our world into a desolate wilderness. Major Jack Mantley Rawson, acting on false information while only half conscious before an operation, issues the fatal order before being given a suspended-animation anaesthetic. Awakening centuries later, he climbs from the hospital ruins to be confronted with a rotting board reading, “Cursed be the name of Mantley Rawson,” for he is now in a world where ordinary men curse his

name, his descendants are hunted down and killed, and telepathic mutants—created by his act—praise him in song.

Trying to help twins accused of being “Rawsons,” the real Rawson is given a vital message to deliver in the city, Kaput-des-Urles. After assorted perils he contacts a thinking few who form a sort of underground opposing the mutants. The Mens Magna, a great talking, reasoning, computing machine, now rules mankind. Armed with a new personality, imposed on his own by hypnosis, Rawson tries to destroy the great brain—only to find the machine has trapped him. Man and Earth are to be destroyed by a critical-mass atomic spheroid, but the Mens Magna claims that tomorrow does not always but only *sometimes* comes—and that there is an alternative to destruction, which only Rawson can find and choose.

“Tomorrow Sometimes Comes” is science fiction from the first to the last page, and is highly recommended. Van Vogt addicts will like it in particular, though the book is by no means an imitation but an unusually good story in its own right.

NO PLACE LIKE EARTH, edited by John Carnell. (Boardman & Company, London. 1952. 255 pp. 10s. 6d.)

This first all-British science fiction anthology, with an introduction very properly done by Arthur C. Clarke, has been long awaited and does not disappoint. Although it is that present-day oddity—a themeless anthology—the stories are well chosen. Of the ten tales included, six were printed here and will be familiar to American readers, particularly since none is older than 1949.

First things comes first in this book, for the title story by John Beynon

(John Beynon Harris, who is also John Wyndham) is the best to my mind. The story is a skillful combination of "No Place Like Earth" and the shorter "Time to Rest": it tells of two cultures developed after Earth's destruction—an aggressive slave state on Venus, assimilation by the gentle Martians—and how a dissatisfied man finds even a strange home is best.

Beynon's other story, "Survival" (under the by-line "John Wyndham"), is about as grisly as one can get, with a hair-raising last sentence. On a spaceship gone wrong a timid woman turns into a lioness protecting her cub.

"Breaking Strain," by Arthur C. Clarke, is another problem in survival: two men have only twenty days' air to last them the thirty days to planet-fall and, of course, safety.

"Castaway," by George Whitely, is a continual-motion, eternal-circle story—the kind of thing nightmares are made of, yet not a horror tale.

Only one of three robot stories has been published here. Peter Phillips' "Unknown Quantity" becomes known before the story ends—robots, it seems, can develop souls, compassion and self-expression. J. W. Groves' "Robots Don't Bleed" uses the hackneyed plot of the girl who couldn't wait for her man's return. She supplies a robot duplicate, but the ending is the usual one—he's a very lucky man! In "Machine Made," by J. T. M'Intosh, the robot is a giant calculator which turns a moron into a mathematical genius.

A super-genius appears in John Christopher's "Balance," but doesn't last long as big business feels the balance of power will be destroyed. Also Class B is William F. Temple's "The Two Shadows." The three survivors of a crash on Mars—the only people left anywhere—are exaggerated caricatures. The tough's too hardboiled,

the writer too, too artistic, and our new Eve too practical. The old Good versus Evil theme ends strangely: Good doesn't vanquish Evil, but murders him.

"Chemical Plant," by Ian Williamson, tells another intelligent-plant story, but escapes staleness through the clash of an inquiring mind and the traditional stick-to-the-rules mind of a Fleet Commander.

Mr. Carnell is now working on a second all-British anthology to appear this year. It is to be hoped that it will keep the high quality shown by his first selection.

THE LAST REVOLUTION, by Lord Dunsany. Jarrolds Ltd., London. 1951. 192 pp. 9s. 6d.

Dunsany occupies a unique place in fantastic literature, although none of his books—with the exception of the Arkham House "Fourth Book of Jorkens"—have been published in this country for a number of years. Some of his books, like this one, have science fiction themes.

The last revolution of the title is a revolution of machines invented by Abelard Pendar—steel and wire monsters with fine wire brains, activated by "little electric currents like what cause thought in our own brains and which stimulate nerves which move muscles." The size of a large dog, they resemble beetles, with four iron legs and a hundred fine clawlike hands.

Robespierre, the first monster, has a brain far superior to man's and quickly graduates from being a superchess player to learning to reproduce himself in a factory set up in the lonely Thames marshes. Finally alarmed—trains and buses run late, cars shy like horses, watch-hands spin round and round, and the lawlessness of the

machines is spreading—Pender has the forces put out and all fuel removed.

Robespierre kidnaps Pender's girl, Alicia, by ordering her motor-bike to carry her off into the marshes. The narrator, Pender, and Alicia are finally besieged by the monster-machines; the police, arriving, find their guns on strike; and the military, in turn, have to use farm carts. Rain, and basins of water thrown on the machines, bring victory: rust saves the world.

This is science fiction à la Dunsany—a shining example of the verbose British style of writing, that wanders on and on so skillfully that it renders the reader immune to the action that does take place. Its talky characters are all seemingly half-witted: indeed, the police ask if there was ever mental illness in either family.

A sample chosen at random may illustrate the "austere, almost Biblical" language claimed by Jarrold:

"While Pender was speaking I noticed that the wounded man in the armchair was staring at me with that intensity of gaze that denotes a high temperature, and I called Alicia's attention to him, and we took him away to the bedroom, and brought the mattress and blankets and sheets and pillows back to it, and laid him on them and undressed him and looked at the long gashes again which the monster had ripped in his back, and found them inflamed; and Alicia renewed the dressings, which she had made out of all our handkerchiefs, and made the wounded man as comfortable as she could in the bed."

Although I am extremely fond of the intense description and adjectivitis employed by some English authors—something many Americans object to—this is still too much of a good thing. I will admit, though, that after reading several pages the prose rather sings to one, as in some Irish books.

"The Last Revolution" is recommended to those who can read anything provided it is by Dunsany, for this is not good Dunsany.

WORLDS FAR FROM HERE, by Dennis Wheatley. Hutchinson & Company Ltd., London. 1952. 1120 pp. 17s. 6d.

This is the first collection—three full-length novels—by a man who seems to typify the best—and worst—of the present British manner of producing a mixed bag of science fiction, fantasy and the supernatural all in the same pages. The *London Times* Literary Supplement names Wheatley "the Prince of Thriller writers."

"Uncharted Seas" is lost-race fantasy of only medium Wheatley quality. A boatload of people abandon ship after a storm. They find the ship again, only to be entrapped in a seaweed "continent" surrounding two islands, inhabited by survivors and descendants of castaways, who cross weeds and water with the aid of gas-filled bladders attached to their heads and feet. The girls of the party are carried away . . . and so it goes.

"The Man Who Missed the War" is one of those British mixtures. Philip Vaudell, originator of a raft convoy afloat on the Gulf Stream (Wheatley's own 1940 project, "Atlantic Life-Line," seriously examined by the British Admiralty), is storm-driven to the Antarctic where he lands complete with a girl stowaway. Here in a Shangri La valley is a race of Leprechauns, victimized by the "Lords of the Mountain" (Atlantean descendants who capture the two). The Lords sacrifice to Shaitan by championing wars and bloodshed through weather control. A more appropriate title would be "The Man Who Won the War," for although Philip loses his life on a basalt altar he is responsible

for the success of D-Day—and what's more is present in spirit with others of "The Mighty Dead" to see it happen. In spite of devil worship, a ghost advisor and such, the book is a fence-sitter as the Atzlaneans are pictured as being "far ahead of us" as electrical experts. The book is good, and recommended.

"They Found Atlantis" is among

the best of the Atlantis tales. The king of bathyspheres delivers a party to a remnant of Atlantis through locks controlled by the tides and pressure—the air-filter for ancient Atlantean mines. The Atlanteans—found when a race of one-time homunculi, the Fish Eaters, are passed—sleep most of their prolonged lives away, traveling the upper world in dreams.



FURTHER BOOKS RECEIVED

SHADOW ON THE HEARTH, by Judith Merrill. Sidgwick & Jackson Ltd. 9/6.

Written in a most compelling style, this disturbing novel concerns an undeclared atomic war and its impact on a young married woman in a New York suburb. The terrible implications and carefully drawn background for this story read at times more like fact than fiction but this somewhat tense atmosphere is, however, relieved by several passages of quiet humour and the characters themselves are vividly portrayed.

Altogether a moving and fascinating book.

THE DEMOLISHED MAN, by Alfred Bester. Sidgwick & Jackson Ltd. 9/6.

This is a murder mystery in a most unusual setting—New York of the twenty-fourth century!

Richly imaginative in his style, the author provides here an absorbing tale to appeal to readers of both science fiction and the detective story.

Ben Reich the "Demolished Man," a ruthless master mind with a zest for power, seeks to destroy his rival for world supremacy: telepathy, interplanetary travel and numerous other futuristic sciences are all part and parcel of an otherwise well-contrived detective story. The enemy of society is eventually tracked down by the police prefect, who in this instance happens also to be a first-class mind reader. . . .

"The Demolished Man" is intelligently written with the accent on Psychology and is at times both gripping and humorous.





BRASS TACKS

IN response to many queries and comments: The November, 1953 cover, by Lee Correy, illustrating the take-off of the *Fafnir* in Lee Correy's story "A Star To Steer Her By," was a Kodachrome photograph. Correy's business is rocket research; the *Fafnir* was fourteen inches high, resting on a card table, with the Colorado sky for a backdrop. The cloud in the foreground, and the jet flame, are out-of-focus cotton batting—the flame has a bit of red ink on it.

Correy had a whole series, including the *Fafnir* being loaded in the gantry, and the whole procedure of take-off. I regret we can't publish them all. The detail of the model work is magnificent; most people seeing the shots, and being told Correy is a rocket researcher, accept that it's a full-scale ship and gantry.

Seen as part of the series, the cloud of our cover shot is accepted as the dust cloud raised by the jet-wash striking the ground.

The painstaking work done on it was *not* done for the purpose of making a cover; the cover was a by-product of Correy's hobby of rocket model work.

That caliber of work can't be done for cover picture prices!

The Editor.

Dear Mr. Campbell:

Occasionally, in my reading of ASF, I come upon discussions that are not only thought-provoking—which is the rule, not the exception—but almost require, at least for my own satisfaction, some answer or amplification, either in the form of marginal notes or a letter.

The communication from Mr. Esquivel (?) and your own editorial in the February issue were particularly interesting to me. My background includes a stretch as a radio operator in the Air Force during World War II

and a present status, to be considerably extended if the Fate and the people who constitute school boards so will it, as a teacher of English; communications in one form or another all the way.

In regard to Mr. E.: I agree with your editorial comment. But I wonder, if I may be permitted to examine one small part of his letter, if he means to say, or imply, that all teachers always work on that basis, even if only subconsciously? Maybe I'm prejudiced, but it does occur to me that, while there are those whose first interest is in maintaining their own feeling of superiority—as witness the professor who resents the brilliant student, a phenomenon not unknown—there are, it seems, some teachers in the world who are greatly and honestly pleased to find the student whose promise may be even greater than their own dreams. Mr. E. suggests that we call them “intelligent” because we feel that *we* have been intelligent enough to be able to get our ideas or knowledge across to them. I question the idea, if it is intended as a general statement. What of the real pleasure one may get from discovering that the student has acquired new ideas, has shown some unsuspected talent or ability, or has actively pursued certain lines with little or no suggestion from us? Or, even granting that such suggestion may have been made, perhaps without our full realization, suppose we discover one day that a girl in our new Junior English class has definite writing ability; this is pleasing to us. Why? We are not responsible for that ability as it comes to us in her first theme of the season, or whatever. So?

At this point I may as well turn to your editorial—and I like your editorials tremendously—and mention one point in connection with the above.

Why should I be particularly delighted because someone understands me, as though I had done well? This is a two-way business. Besides, when do we know, really, just how thoroughly *we* are understood? Obviously, not when the student can repeat our explanation—which may very well be secondhand, anyway—like your tape-recorder. Not even, necessarily, when he can paraphrase it. High School students may tell the story of “Hamlet” briefly, clearly, and well; but how thoroughly do they understand the play or the Prince? Certainly, the teacher must help the student to the understanding. But the teacher can hardly do it all. So, then, this may follow: understanding of our teaching or of what they read apparently implies a capacity to add something more. Well, why not? There's your discussion of abstraction of ideas and whatnot from low-redundance communication. There's the idea that it's what is left out of a poem that is important; to the reader of the poem the whole—the poem in essence—is greater than the sum of its parts—ink on a page. That's why Homer never describes Helen of Troy, if you like.

As far as my own variety of communication is concerned, when I'm not saying too much, I'm probably saying too little—another way of looking at that word “redundant” is implied—so that my students have to search all over the place for an idea, presuming I have one to communicate. Which brings it down to this: I'm pleased when my students learn anything because if they're sharp enough to get it in spite of my obscurity, then they're trying. And they're good.

But I suppose you could make out a good case for my feeling of superiority from the very fact that I've written this letter.

One word: where do you put non-objective art in the field of communication?—Allan G. Keniston, Deerfield High School, South Deerfield, Mass.

Unfortunately, there are "teachers"—at least individuals going under that title—who prefer the master-slave relationship. Their satisfaction is successfully controlling their students. Then, true teachers exist who work in the hope that, once in a while, they'll have the deep satisfaction of touching off a rocket-mind—a mind that, once fired, takes off for the stars.

Dear Sir:

Your editorial in the April issue of ASF is one of the worst I have ever read. In all the long years of reading your magazines I have never before seen an editor who was so arrogant as to antagonize his readers with articles such as you have been writing.

Obviously, you know next to nothing about the subject you have chosen to discuss. Why you persist in supporting Aristotelianism is hard to understand, in view of the increasing support being given to non-Aristotelianism by scientists of every kind.

Apparently, you assume that non-A is just another wild armchair theory, to be discussed and pigeonholed neatly, and then ignored. As a matter of fact, non-A is nothing of the sort, but instead is a new way of life, a new orientation, a new way of evaluating and talking. The importance of this new orientation is partly shown by the fact that its principles are taught in 25 colleges, 3 encyclopedias have articles on it, at least 100 teachers incorporate its principles in other courses, and a basic bibliography of 300 items exists. Two separate organizations devoted to the non-Aristotelian revolution have 4000 paying members and two journals.

Your assumption that the "Law of the Excluded Middle" comprises essentially all there is of Aristotelian thought is so ridiculous when stated like this, that I am sure you would retract your editorial if you could. The above law, first formulated and advanced by Aristotle, says that "A is either B or non B." Certainly, in ordinary discourse, this law must be obeyed if the speaker is not to contradict himself; but when this law is applied to objects or events it gives a false two-valued character to the universe. In Alfred Korzybski's own words, "... the ... law establishes as a general principle, what represents only a limiting case, and so, as a general principle, must be unsatisfactory." Clearly, this does not mean that the Law of the Excluded Middle is never true; only that it is sometimes false. The fact that it is sometimes false is enough to establish that the actual universe around us obeys non-Aristotelian principles, and we can understand it better if we orient ourselves in the same way.

Other benefits derived from non-A include better racial relations due to tolerance of others, better communications, better understanding of human motives, increased efficiency in teaching, and improved treatment of both mild and serious mental derangements.

Don't irritate your readers by further campaigning. You should be supporting this movement instead of hindering it.—G. J. Williamson, 648 Carver Street, Philadelphia 20, Pennsylvania.

To the Editor:

I am a student of Logic and Philosophy at Harvard University. I have been reading and enjoying science fiction for many years, now, and generally have no complaints or criticisms

to make. For some time, however, I have read with increasing annoyance the many editorials, and the like, on so-called "Aristotelian Logic," and the proposed Null-A logics. Your editorial of April, '53, seems to provide as good an opportunity as any to get a few simple facts straight, so that we can dispense with this nonsense about non-Aristotelian logic.

Your editorial, in effect, says that while all human action is governed by, and completely describable in the framework of, an Aristotelian Logic, human thought is capable of "grays and shadings and tones," which it is even possible to communicate to other human beings. You then go on to make the error, apparently indigenous to science fiction, of asserting that these "grays and shadings" are characterized and governed by a multi-valued logic. I do not know just what the fascination of multi-valued logics is to the modern scientist and science-fiction writer, but their misuse and incorrect application is perhaps the most common modern error. Since most of your stories are chemically, physically, and biologically correct wherever possible, I think we ought to set the record straight for logic.

First let me say un-equivocally that not one of the conditions mentioned by you in this or any other article, nor any of the conditions ever described or alluded to in your magazine or any other magazine, can be characterized by anything but two-valued Aristotelian Logic! Furthermore, probably 99% of the errors can be traced to one fundamental misunderstanding of the nature and claims of two-valued logic.

Let us consider the old situation of the three buckets of water, filled respectively with hot, lukewarm, and cold water. Now, it is said, this is a situation in which we need three values to describe the situation, for

it is not a true-false, on-off, hot-cold set-up, but a yes-maybe-no, hot-medium-cold one. That this point of view is subscribed to by you can be seen from the passage in which you say of Aristotelian logic that it "insisted that everything in the world was either pure white or pure black," and later, that "his every act must necessarily be on a yes-or-no basis."

In other words, you seem to think that Aristotle was unaware of grays, or lukewarm water, or of indecision. You also seem to think that he, and Aristotelian logicians, wish to restrict the world to what in ordinary language are called "opposites." Your view, however, is the result of the most elementary misreading of Aristotle and the logicians. In fact, it is so simple a mistake that I am afraid it will almost come as an anticlimax. To state it as simply as possible, no one ever claimed that water was either hot or cold. They either claimed that it was hot or *not hot*. And by not-hot is meant anything but hot, including lukewarm. Similarly, no one has ever claimed that things are either black or white. They have claimed only that they are either black or *not-black*, where not-black may include any shade of gray, green, chartreuse or purple you like. It may even include those things which are not any color at all, like sounds or tastes—there, incidentally, would have been a more convincing argument for three-valued logics, although it would have been equally incorrect.

As for your shadings of human thought, the same applies. Just as the existence of thousands of alternative actions in a given situation does not change the fact that any given one of them is either *done* or *not-done*, so too, the existence of even a continuous shade of feelings and states-of mind does not change the fact that for any given one of them, a person either *feels* or *not-feels* it.

Perhaps one of the sources of your error is the failure to notice that the values, truth and falsehood, are applied by logicians to *sentences*, not to situations. Thus, one may have a description sentence for each of a thousand possible events, each one stating that that event has taken place, but once those sentences have been composed, it is absolutely and unequivocally true that each one is either true or false. The shading comes not in the "values" but in the situations described by those sentences, and Aristotelian logic is as alive to such facts of life as modern science fiction.

In short, the solution to the "problem" stated at the end of your editorial is that it doesn't exist. Our actions and feelings are equally shaded, and equally characterizable completely within old-fashioned Aristotelian Logic. As for why that fact is so, the best answer I have seen to date can be found in Kant's "Critique of Pure Reason," but that is another, and vastly more complicated, question.—Robert Wolff.

"Let's you and him fight, huh?"

Dear Mr. Campbell:

More than once I have attempted to read an article in a somewhat unfamiliar scientific field and found myself spending so much time in running down the definitions of the terms used that I simply had to quit in the middle of the article. Not only was I unable to locate the definitions, easily, but I was left with a rather vague idea of the article's context.

Isn't it possible to simplify the scientific vocabularies so that a worker in one field could read reports of another field with a reasonably accurate understanding of the terms used?

Surely there could be a basic scientific vocabulary which could be applied to nearly all fields. By proper use of modifiers or adjectives, the basic words would be applicable to the particular science discussed. As a simple example, Resistance is a basic word. With the addition of modifiers, such as Electrical or Mechanical, the terms Electrical Resistance and Mechanical Resistance could be comprehended.

I am aware that not all terms could be simplified, but I am also aware that certain terms are slight variations of a basic term and, in my opinion, should be eliminated.

Has anyone any suggestions?—T.D.

I strongly feel that crossover articles informing specialists in one field of the work done in others are badly needed; I try to run such material in this magazine. The only way I've found to do it is to insist on terminology of College Freshmen level; all specialists use about the same vocabulary at that level. From there on they go into "schists" and "mocrromhos" and "saporophytes" and other highly special Technicalese.

Dear John:

Parm me, but may I disconcert Brass Tacks by exhibiting therein what all true believers will regard as bourgeois deviationism? The heresy I wish to utter is that the term "science fiction" is a gross misnomer regardless of whether the accent be on the science or on the fiction. We need a new but self-explanatory word for literature that stimulates the imagination. A committee presided over by yourself, Dolton Edwards and de Camp should come up with a good one.

The redoubtable P. Schuyler Miller is the unwitting cause of my backsliding from the faith. I read with

great interest the results of his efforts to construct an ideal stf library of twenty-five books. Forthwith I tried compiling a list of my own—and found myself putting down tomes of major interest to any science-fiction fan though not describable as science fiction. Some were purely fictional without any pretense to science. Some were entirely scientific and devoid of fiction. But all had the ability to gratify to the full that peculiar mental appetite we call imagination.

The term "science fiction" is, therefore, too exclusionist and removes from the imagination-stimulating field great works that should lie smack in the middle of it. I won't bore you with my complete list; it starts off this way:

Thor Heyerdahl: "American Indians In The Pacific."

Thor Heyerdahl: "The Kon-Tiki Expedition."

Rene Fülöp-Miller: "Leaders, Dreamers and Rebels."

Charles Fort: "The Books of Charles Fort."

Rachel Carson: "The Sea Around Us."

Michael Fessier: "Fully Dressed And In His Right Mind."

It isn't until I come to book No. 7 that I reach what is viewed as the orthodox science-fiction field. Yet I doubt whether there's a fan in existence who won't admit that "The Kon-Tiki Expedition," for instance, is a top-grade fantastic story about another world. True, it is written by a professional scientist and that the strange, alien world happens to be real but from my viewpoint that's all to the good. Indeed, had I happened to read the yarn as a serial in *Astounding* I'd have considered it an editorial triumph and in no way out of place in your pages. But this and others like it do not appear in "science fiction" listings. They are excluded mostly

because of an inadequate term, See what I mean?—Eric Frank Russell.

"Kon Tiki," certainly, makes wonderful reading. Rather like that Clement's serial, in fact!

Dear Sir:

Last night I read and then reread "The Cog," by Charles E. Fritch, in the November, 1953, edition of *Astounding Science Fiction*.

It is the finest short story I have read in recent years, not only in science fiction but in fiction as a whole. Mr. Fritch has produced the free, simple and magnificent kind of story anyone would appreciate, thrill to.

It is a glimpse of all of our souls who were born twenty years too soon.

I feel that "The Cog" should be recommended, somehow, as a candidate for any or all of the awards given for "the best short story" of 1953. Still, such recognition would be inadequate.—Don Callander, 2115 F Street, N.W., Washington 7, D. C.

Those "simple little stories" are the hardest kind to do!

Dear Mr. Campbell:

While your recent editorials will no doubt evince a storm of angry howls of protest from proponents of non-Aristotelian logic, I have no desire to take part in the debate. However you raised an interesting question in the last paragraph of your April editorial that deserves an answer.

You ask how it is possible that we communicate two-valued information with "self-evidently" continuous tones. I think that some of the recent work that has been done in the field of the mathematics of communication provides the answer.

Those of us who are familiar with the techniques of Fourier analysis know that any function can be approximated by a sine wave and its harmonics. Although this has been known for years, it was long thought of as a method of approximation that could yield exact results only through the consideration of an infinite series of harmonics. However the key to the solution was found only a few years ago by Hartley and has been expanded in contemporary times into a mathematical theory of communication by Claude Shannon.

The result of this work that interests us is the theorem that any signal of duration t and bandlimited from 0 to w in frequency can be completely specified by stating $2tw$ binary numbers. Hence any signal sent over a practical channel—such as the human voice—with a limited frequency range is mathematically equivalent to a series of “yes-or-no” signals. Hence on first appearances it would seem that your position that we think and act on a binary basis is not weakened by the fact that we communicate in continuous tones.

However as we delve more deeply into the mathematical theory of communications, we discover criteria determining the efficiency of a communication channel. We find that a binary system is less efficient than a continuous system as regards information per communication element, with the maximum rate of transmitting binary information determined by the upper frequency limit of the channel, which limit also determines the maximum rate of information transmission of a continuous channel. So there seems little grounds to prefer one system over the other.

Now let us introduce another factor: that of the noise that is present in the system. If the noise level is high, a very “inefficient” coding

system—such as a binary system—is the only way to transmit information without having the information distorted by the noise. As the noise decreases, we could increase the rate of transmission of binary characters, but it is usually more practical to use a continuous system, a system with more gradations of meaning, to convey the information.

A conclusion that might be drawn from this, although I will not advocate it without reservations, is that by applying this theory to non-electrical cases we find that when the semantic “noise” is high an Aristotelian, binary system is demanded; but as the semantic noise is reduced, as civilization advances, a continuous, non-Aristotelian system becomes not only possible but more efficient. I’ll let the non-Aristotelians take it from there.—B. U. Cardwel, 18 Hyde Hall, Bowdoin College, Brunswick, Maine.

That sounds like a highly interesting approach to the question.

Dear Mr. Editor:

I would like to suggest the following possibilities about this “Null-A” business:

(1) That the wildest “Nul-A-ists” do not mean “Null-A” at any time; at most, it is a question sometimes of “A-minus-one, two, three . . .” There are occasions and observations when the usual “gears” appear to slip a cog or two, but let us not talk loosely as though reason itself were stripped. We can, and perhaps sometimes should play chess “I’ll spot you a castle”; it is doubtful if we could play with no rules whatever: multi-values perhaps, but a limit upon the number!

(2) That we should take more care in marking out when, it seems, we are describing what happens and

when, it seems quite likely, we are only describing our own ignorance, thus: I am informed by my physicist friend, "We can tell where an electron is, or how fast it's going, but never both, nature's just that way." My friend probably tells the truth in this sense, that location, or velocity, not both, are within his present power to measure; but when he asserts that location and velocity can never both be measured in a single instance he is merely making a deduction which may be reversed in tomorrow's headline. Yet he hardly seems to realize that he is speaking on these two different levels at once.

(3) That any assumption whatever about the nature of our human thinking is (a) contradictory and (b) a leap in the dark. If we assume that our minds are merely the reactive combinations of neural circuits however understood, we have no reason to believe them so, or anything else; and if we assume some creative power within the thinking process, we have nothing like it to point to in nature; it is, if it is, unique so far as known. It's faith either way.—Frank P. Beardslee, 77-15 64th Place, Glendale 27, Long Island, New York.

And may I suggest that there is one absolute certainty—a basic certainty we all need to work with. We do not—absolutely do not—know all the answers!

Dear Sir:

As you have printed a letter—in Dalton Edwards' "Klasrum" spelling—from an opponent of spelling reform (John Ruyle in Brass Tacks, January 1953), maybe you will entertain a letter (in Webster spelling) from a supporter of spelling reform. The remarkable thing about Mr. Ruyle's

letter is not that he strayed from Mr. Edwards' scheme once or twice, but that the strayings were so few. Just how much attention is an opponent of spelling reform ready to give to it, for the sake of a moment's playful satire? Very little, I suppose; so we have the surprising spectacle of a near-perfect spelling paper turned in after a spelling "course" lasting perhaps half an hour! For the same level of expertness in Webster spelling, we have to part with years out of our lives.

Foreigners always remark upon the retardation of our children's education. Age for age, ours are two to four years behind their non-English contemporaries. In Germany, Holland, Norway, and in all the Latin and Slavic countries, spelling is over and done with at the end of the first year or sooner. In America and England spelling eats deep into school schedules throughout eight years; even so, it is poorly learned, and spelling troubles undermine every other classroom skill.

Maybe Mr. Ruyle does not begrudge for years of his children's lives to this Moloch of irrational spelling, but I do. The sacrifice of time is bad enough. I resent even more the inescapable weakening of the learner's faith in reasoned logic. Large areas of our vocabulary can be reduced to rules, but these areas are chiefly literary or scientific. The everyday vocabulary is full of absurd spellings which must be learned case by case the same as Chinese characters. The child can put no trust in reasoned applications of rule. He relies upon memory alone. What a preparation for the life of the intellect!

Even in areas of seeming regularity, the Webster spelling lets us down in sly and cruel ways. For example Mr. Ruyle seems to think that schism is pronounced skizm because it looks

that way. Let's not smile at Mr. Ruyle's error; few of us could attempt such a feat without revealing similar pranks which spelling has played upon us.

Mr. Edwards' scheme (Meihem in *oe Klasrum*) is not quite ideal. He overlooked some good bets, particularly among the vowels, which he leaves in semi-anarchy. The great merit of the plan is its conciseness. The final proposal, we may be sure, will be equally concise and will confront us with the same direct challenge. Arguments about detail, which now divide us spelling reformers, will all have been settled. The final product will bring order out of chaos, quickly, with minimum study and without marked letters, just as in Edwards' plan. Author and publisher deserve our best thanks.

Agreement upon a system, which now seems such a goal, will be really no more than a first step. The next step will be to persuade nine tenths of the editors, typesetters, writers and teachers to the change. For fifty years, spelling reform has trusted to gradual evolution, and for fifty years spelling reform has lost ground. Gradualism in spelling reform is at heart as absurd as gradualism in weights and measures. Nothing will do but a sweeping overhaul of our entire written language from Alaska to Cape Town. Re-education of proofreaders and linotypists must be subsidized lavishly—say at Miami or Waikiki. Every publisher must be required to reissue his entire output in the new spelling, exchanging the new books

gratis for the old, with the government picking up the check. The expense shrinks to nothing compared with the benefits. It will be the best billion dollars we ever spent.

Czarist Russia had allowed its spelling system to deteriorate—not as badly as English, but enough. The Soviets lost no time in reforming the spelling. Today it is said to be almost impossible for a Soviet child to give serious attention to a book in the old style. Such quaint old letters! Such absurd combinations! The same fate awaits the classics of democracy if we cling to the ancient spelling until some dictator reforms it. Not by prisons and torture, simply by ridicule, children can be cut off overnight from their heritage as long as it wears this shabby wrapping.—R. L. Benson, Route 2, Portland 10, Oregon.

As a long-time champion bad speller myself, I hate to say this, but . . . one thing a child must learn no school, and no parent, would willingly teach: The Rules and the Laws aren't perfect. Logic is not infrequently irrational. Before trusting a rule, check with memory—i.e., experience.

English spelling is a wonderful demonstration, learned early and often, that only experience is a truly reliable guide. "I before E except after C" is fine. So we have "protein."

And for a difficult, strangely spelled language, requiring all that extra schooling . . . why is it that English has achieved such influence on Earth?



EMOTIONAL SENSES

CONSIDERATION of that problem of teaching language to a computing machine leads to some concepts that look extremely interesting. Obviously, one of the major problems in teaching a computer to translate human language is the need to establish meanings for the most deeply human terms of all—emotional terms.

Be it noted that the philosophers of the past have condemned emotion, preached against emotion, demeaned emotional thinking, and sought to end emotional thinking in their students. Science fiction, going along happily, has pictured the superrace as being purely logical, non-emotionalist people. Society generally deplores emotion, and hopes we get over such undesirable behavior.

But—*nobody has defined* this thing they all decry. Society condemns emotional thinking—and damns science as being cold and inhuman and mechanical. Is it possible that "emotional thinking" can only be defined as "the way the other fellow thinks," while "human warmth" is defined as "the way I think?" If so, we may have a rather difficult time getting these concepts into the Mark IV.

Let's try a different approach. Since neither society, philosophy, sociology nor psychology has been able to handle emotional thinking adequately, it might be proper to hypothecate that they've been approaching the subject from the wrong aspect altogether.

Let's consider the business of emotional thinking from the computer's viewpoint for a while. It's unable to react in any way other than that specified; therefore specify what you mean by emotion. The problem of specifying emotion is one the com-

puter can't solve, obviously; that's for the human operators. But the computer, having no sense of shame about its own ignorance, will blandly admit that it does NOT understand. It won't bluff that it does, when it has a faint glimmering it hopes might be the right answer. It has no shame, and no pride; if it doesn't know it is not ashamed; if it does know, it's not proud.

Because it is incapable of bluffing—it will force the human operators to stop bluffing themselves, and admit their own ignorance.

"The probability of correct prediction in total ignorance is zero." That's the First Theorem of Stupidity, as Wayne Batteau sent it in; it's worth considering.

I don't know what emotion means. Therefore I'm going to try to analyze and see what data can be found as to the meaning and value of emotion.

Since you're human beings yourselves, you realize full well that I wouldn't be writing on this subject if I didn't believe I had a useful—i.e., partly-workable—idea as to what emotion is. But I don't know—and I challenge anyone, anywhere, to state that he does know, and prove it!

My suggestion involves a flat reversal of two widely accepted ideas with respect to emotion, and the nature of Man's psychology.

First, in flat contradiction of the stated opinion of philosophers and of society: *No intelligent entity can exist without emotion. The true measure of intelligence is the measure of the emotional sensitivity of the entity.*

Indicative evidence: A rabbit isn't a very emotional creature, but it's immensely more sensitive than a

turtle, for example. It's also conspicuously more intelligent. A dog is far more emotional than a rabbit—and also more intelligent. A chimpanzee displays far greater intelligence than a dog—and also far greater emotional complexity. Finally, Man is the only animal that either weeps or laughs; Man has the greatest range and complexity of emotion known.

The objective evidence suggests that emotion, far from being destructive to true intelligence, is essential to it!

The second proposed postulate that is flatly contradictory to most standard psychology is: *the instinct to predict the future is more fundamental than any other yet known.*

This postulate holds that sex, hunger, all others are derived from the instinct to predict; that organisms must *act as though* they could, in actual fact, know what the future was to be. This involves accepting as a basic proposition that organisms act teleologically. It also requires the acceptance of the concept that their actions will display phenomena that would be expected in an organism that actually had true precognition—a true and functional time-viewer machine . . . with anomalous phenomena resulting from the fact that the organism's "time-viewer machine" didn't work right.

I hold that this postulate is essential for the following reasons: It is impossible to change the past. The present cannot be changed effectively; it's too late. Only the future is mutable, and only in the future can we achieve any satisfaction or satisfy any needs or desires we have now. The past has no value except as it can be used to predict the future; the present has no value except as it can be used to control the future.

If I am seeking to cross a busy

street, it does me no good whatever to know that the path across *was* clear; it does me no good to know that the path *is* clear, since I can't move at the speed of light, and the only knowledge that can benefit me in any way whatever is to know that the street *will be* clear at the succession of space-time loci I *will* occupy as I occupy them.

To my extreme sorrow, I do *not* have precognition; I do not in fact know the future. It is therefore necessary for me to compute a probable future system of events, and then act on that prediction *as though* it were true precognition. I have no choice; I must act on my predictions.

The cat pouncing on a mouse must direct her trajectory as would a spaceship crew; she heads for the point in space-time where her goal will be—it would be completely futile to head for where the goal (the mouse) *is*. It is essential that any animal organism base all its actions on a feedback loop from the future; its actions are controlled *in toto* by the *future* state of events—as the individual organism conceives them to be.

You may have a better time-viewer than the cat, and predict that she is going to get into trouble. To you, then, the cat appears to be acting stupidly. That's due to the unfortunate-for-the-organism fact that precognition doesn't actually exist; the organism's computer-predictor is doing its best to get accurate predicted data on the basis of the information system and method-of-computing system it has.

The essential difference between any higher animal and an inorganic mass lies in the assumed-teleology system of the animal. If I throw a stone at a boulder, the results are readily forecast; the stone doesn't avoid the boulder. If I threw a sparrow at your face, on the other hand—! The sparrow would compute a prob-

able future course of events, and react *not* to actual collision, as the stone-boulder system would, but to the future-probable collision. The sparrow, in other words, would rebound from a collision that hadn't happened yet. So, of course, would you!

Once the concept of the feedback loop from the future is assumed, a number of items begin to fall into line. Evidently, the function of the brain is to provide a sensory link to the future, as the eye provides a sensory link to the present. Since the *actual* future can't be sensed, a mechanism for setting up a future-analogue is necessary. Then this analogue must be studied, and actions-now so adjusted as to cause the situation-then to be compatible with the desires of the organism. The cat must predict the cat-mouse system's dynamic future, and act-now in such fashion that the cat-mouse situation-then will match her desires.

Then the mind is not purely computing mechanism, but must include as a part of it, a highly organized computing arrangement.

Now let's add another concept. The human being must be a self-regulating system; the mind, also is a self-regulating system.

There are certain basic laws of self-regulating systems that the cybernetics engineers have worked out; one of them is that any self-regulating system—whatever its nature—*must* involve feedback.

If the mind is capable of self-regulation, then it follows that the mind must have feedback systems.

The sensory systems in the physical organism of Man are very poorly recognized in ordinary understanding—and therefore, since the language doesn't adequately express the ideas, you are unable to think adequately about the sensory systems you actually

live with. As a quite simple example, suppose you reach around behind some inaccessible apparatus, and feel a certain unit that you can't see. "It's a gear about one and a quarter inches in diameter, on a quarter inch shaft carried on a forty-five degree angle bracket," you say.

How do you know? "Why . . . I felt it!"

Tsk tsk. The classic sense of touch is a sense of contact, no more. A sense residing in the nerve-endings of the skin. How did you determine that gear was about one and a quarter inches in diameter? Not with your skin nerves, you didn't! You didn't "feel" it in that sense; you goniometered it, by using your goniometric sensory system. Every joint in the human skeleton is equipped with a fine set of specialized nerve-endings that measure the angular position of the two bones involved. You wouldn't have been able to determine the spatial relationship of those metal parts without it; the contact-sense served only to let you know when your caliper fingers were properly positioned. The goniometric sense gave you the information you reported.

But no primitive people, developing a language, would have developed the concepts of a goniometer, or recognized the need for a term to describe something they couldn't point to.

Consider the "sense of thirst," too. We use the phrase, and consider it as a metaphor, an idiom. It isn't; it's a correct and exact statement of a fact. The human body has a specialized sense-organ that measures the ion-concentration in the bloodstream. When the ion concentration rises, the blood needs dilution. Normally, there is considerable water stored in various ways in the body, and this water can be released into the bloodstream on signal from that specialized sensory

bundle; when the water reserves are low (as determined by another group of specialized sensing systems) and the ion concentration is high—you feel thirsty.

And let's see you explain *that* to a Roman Citizen! Naturally, the language is deficient in the terminology necessary to understand our own structure, particularly where the functions of those structures are subtle, and operate at a level below direct observation of the cruder senses such as sight or hearing or the contact sense.

To achieve a self-regulating physiology, an immense number of complex sensory mechanisms was essential. There has to be a sensing system whereby the blood sugar is metered, and the reports passed to the islets of Langerhans in the pancreas, so the insulin supply level can be maintained in proper balance. That's a true sensory system—but try and explain it to even so intelligent a man as Shakespeare!

Now let's take the next step. There must also be sensing mechanisms which report on *mental* functioning. If there were not, it is simple logic that the mind would not be able to be self-regulating.

I suggest that what we know as emotions are the results of those special mind-function senses.

Consider some of the feedback sensing mechanisms that a self-regulating mind would *have* to have. First, since the effort of the mind is to predict correctly, there must be a sensing system whereby the success or failure of that effort can be detected. If prediction matches eventuation, an "All's well" signal should be received; if prediction and eventuation do not match, a "TILT!" signal should be received.

Then let's try this definition for two

well-known emotions; intellectual satisfaction results from perceiving that prediction matched eventuation. Sorrow results from perception that prediction did not match eventuation.

A number of other emotions can be defined in terms of the existence of mind-sensory feedback systems. Fear, for instance, appears to be the sensory report that the extrapolated curve of events has a negative derivative—a downward slope—with respect to organization of the self-system. (*Self-system* here meaning everything the individual identifies as part of his necessary life-system, everything he identifies as "my . . ." as "my home" or "my children" or "my country.")

Incidentally, it follows logically from this definition of fear that any effort to change a man's beliefs will cause a fear-reaction in him. If he believes A is true, and you *did* succeed in changing his belief to not-A, you would have disorganized his original belief system—which he identifies as "my beliefs." He won't fear you if your arguments are weak and futile; he will fear you if you are a powerful cogent, and wise speaker. He'll also tend to fear any system of psychotherapy that he believes will actually change him!

Now evidently the optimum intelligence is one that never makes a mistake. To achieve this, it's necessary that the intelligence learn how to avoid mistakes—and this requires that it be exceedingly sensitive to very small errors.

Then the optimum intelligence would require exceedingly sensitive mental-condition-sensing equipment. If emotions are in fact that mental-condition feedback system, then it would logically follow that emotional sensitivity, and emotional complexity were directly correlated with high intelligence.

THE EDITOR

ELDER BROTHER MARS

SINCE Lowell's earnest study of the planet, and his many writings and speculations concerning it, Mars has been pictured as a dying planet, dying of old age, losing air and water into the vacuum of space, while an ever more severely strained people try to maintain life.

As of the time he wrote, those speculations were based as soundly as possible. As of today, they are not—and some really more interesting aspects appear.

First, thermodynamic calculations, based on specific heats and masses, thermal conductivity and radiation, show that any of the planets, from tiny moons to massive Jupiter would have, perforce, cooled so rapidly as to be solid within a mere instant of geological time. In the first place, they would cool violently by evaporation—literally. High temperature molecules can escape from a gravitational field where cooler—and hence slower—molecules are retained. That effect is a perfect Maxwell's Demon set-up; the Demon of gravitation selectively puts the hot molecules in one lot—the escapees—and the cool molecules in another lot—the planet-to-be. Second, radiation from a red-hot planet is extremely rapid; the Sun has to annihilate three million tons of matter per second to maintain its surface temperature. The smaller the planet, the faster it will cool, of course—but even the largest would cool in a few hundred thousand years—down to a point.

In any case, the differences in cooling time were unimportant in a geological time-scale sense. Mars is no older than Earth; it was just

smaller to start with. Its rate of water air loss at the present time is infinitesimal; it lost water and gases during the period of original rapid cooling by evaporation. In all the ages of organic evolution on Earth—a period of over one billion five hundred million years—the conditions on the surface of Mars would have changed so slightly as to be of no importance to life processes. Mars isn't a wizened "elder brother" of Earth; Mars was simply the runt of the litter, robbed of its birthright from the beginning by the bloated giant, Jupiter.

There would, then, be no reason to expect evolution to have "had time to progress further on the older planet"—it isn't older. Evolution wouldn't have progressed as far, probably, because of the less favorable conditions.

But there's a more interesting, a wider-spread time-scale to consider. Based on our present day—admittedly not final and absolute!—knowledge of nuclear physics, the only elements that stars can manufacture are helium, carbon, nitrogen and oxygen, using hydrogen as the building material. No heavier element can be made in a star, even those elements up to silver which yield energy when they are formed. To produce elements such as uranium, which can be formed only under conditions of such unimaginable, appalling violence that the atomic bomb would, instead of exploding, be forced to *implode*, something utterly different must be postulated.

A nucleus such as uranium—or thorium, bismuth, even lead—represents a system of nuclear particles

jammed together under such appalling violence that it *lessened* the external pressures and energy-intensities to force those nuclei together. Somewhere, somewhen, the intensity and density of energy-matter must have been so inconceivably great that the violence of the atomic fission bomb would have represented a cooling, expanding decrease of violence! In that environment, uranium, instead of fissioning to barium and xenon, was squeezed into being by pressures and cataclysm sufficient to force barium and xenon into one!

From that ancient center of inconceivable violence came uranium, iron, all the heavy elements that no star can produce. All the unstable elements, like uranium, thorium, and the others must have existed only, and temporarily, since that time.

Because they are temporary and radioactive, we can form an estimate of how long ago that time was. A dozen lines of evidence suggest something about four billion years ago—which checks moderately well among

different indications as the time at which the universe exploded into being.

There could have been no suns, no planets, no life before that time. Our Sun and our Earth, then, are about as old as any existing in all the universe. Man is not a latecomer in the universe; his world started even with a billion others.

The remaining questions, however, are two: does evolution always proceed at the same, or approximately the same pace? And—the most recent evidence suggests Man, modern Homo sapiens, has been on Earth for approximately four hundred thousand years. Did other intelligent races dawdle in changeless barbarism for three hundred ninety thousand years after they appeared? After all, two hundred thousand years of civilization would be time for quite a bit of advancement—though even two hundred thousand years is an inappreciable percentage of error in the total time-scale we're considering!

THE EDITOR.

— American Magazines —

American publications, if they are of a technical or educational nature, may still be obtained over here by means of an annual subscription. Here are just a few of the many available:

	Annual Rate		Annual Rate
HOBBY DIGEST - - - -	11/6	POPULAR SCIENCE - - - -	30/6
FLYING MODELS - - - -	12/6	SPORTS AFIELD - - - -	30/6
HOME-CRAFT - - - -	18/-	RADIO-ELECTRONICS - - - -	32/6
SCIENCE & SOCIETY - - - -	21/6	POPULAR MECHANICS - - - -	32/6
THE RING - - - -	25/-	ETUDE - - - -	34/-
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